The
Geographical Journal.

No. 3. MARCH, 1901. Vol. XVII.

IN COMMEMORATION OF THE REIGN OF HER LATE MAJESTY, QUEEN VICTORIA, EMPRESS OF INDIA.*

I. PRESIDENT'S ADDRESS IN COMMEMORATION OF HER LATE MAJESTY.

Our late beloved Queen was the Patron of this Society for sixty-three years, and the generous and enlightened bestower of the royal awards through the hands of the Presidents and Councils for the same period. We have, therefore, felt it to be our duty to devote an evening to the commemoration of Her Majesty's reign from the point of view of our science.

In common with the rest of the late Queen's subjects in all parts of the world, we geographers have felt admiration for the rare and lofty gifts of the greatest and best of our sovereigns; we have felt love and devotion for the gracious lady who, with unfailing warmth of heart, has shared with closest sympathy the sorrows and anxieties of her people. We have been grateful to the able and sagacious ruler who, through her long reign, bore the heavy burden of the affairs of a great empire in spite of her own heavy trials, and of the increasing weight of years. We fully shared in the deep and reverential grief of the rest of her subjects when the news of her death cast a shadow of gloom on her vast empire.

The end of that precious life brought most vividly before us all the

* Meeting of the Royal Geographical Society, February 11, 1901.

glories of the longest reign in history. Not counting their minorities, Harald "the fair-haired" of Norway, and Louis XIV. of France, reigned for as many years, but not actually so long. Jayme I. of Aragon reigned as long, but including his minority. Our beloved Queen was spared for all these years for the good of her people, for we know now how great a share Her Majesty's personal character, her influence wisely used, her experience and knowledge, had in that marvellous advancement which has signalized the last sixty years. Queen Victoria has been part of the lives of her subjects from the earliest time to which their memories go back. Very few can remember any other sovereign in this country. I am one of the few. As a very little boy I well remember seeing the Princess Victoria on what must have been nearly her first public appearance. In August, 1836, when I was six years old, there was a grand dinner in St. George's Hall at Windsor, and I was in the gallery through the kindness of Sir Herbert Taylor, an original Fellow of this Society. My gaze was riveted to the dazzling masses of gold plate on the long table, until the sound of music made me raise my eyes. Then I saw the old King leading the fair young Princess up the room.

But even before that event, which has left such a deep impression on my mind, and long before her accession, the young Princess Victoria took an interest in geography and in exploration. Let us fancy ourselves in a room in Kensington Palace in the winter of 1833. There is the Duchess of Kent with the young Princess Victoria, then in her fourteenth year. Maps are spread out before them, and the Secretary of the Geographical Society is in attendance. With him are two great arctic explorers, Captains Beechey and Back. They are there to explain to the young Princess the geography of the region in which the Rosses were lost, and the route Captain Back intended to take in searching for them; and the Princess Victoria took a lively interest in following the intended track on the chart. Nor did her interest end with the interview. When her mother subscribed £100 towards the expenses of the expedition, the young Princess sent Captain Back a present of a case of mathematical instruments and a pocket-compass as her contribution to the equipment.

It turned out that this delicate little pocket-compass, the gift of the Princess Victoria, proved to be extremely useful. In the estuary of the Fish river, when there was great disagreement in the other needles in denoting magnetic north, that of the Princess could alone be relied upon; it almost seemed like an emblem or forecast of the excelling steadfastness to duty of our great Queen, "true as the needle to the pole."

With these and other memories of the interest the young Princess had taken in our labours, our Council hailed, with heartfelt congratulations, the accession of Queen Victoria. In almost prophetic words,

our Council * expressed an earnest hope that "Her Majesty's reign would be famed for its glory and prosperity, and for the promotion of geographical knowledge; that it might be rendered illustrious as the era of important discoveries which may diffuse the blessings of civilization throughout the globe, as well as endeared to the affections of a free and grateful people." We all know how fully and completely the hope expressed in those prophetic words has been realized.

One of the first acts of Her Majesty's reign was to intimate her gracious intention to succeed her uncle, our Founder, as Patron of the Society, and to bestow upon us her royal premium for the encouragement of geographical science and discovery. Since Her Majesty's accession this royal premium has taken the form of two gold medals granted annually—the Founder's Medal and the Patron's Medal. If, as we trust, His present Majesty should be pleased to succeed to the patronage of the Society and to continue the grant of the royal premium, there will still be the Founder's Medal and the Patron's Medal. But it has been suggested that, in memory of our beloved Queen, there should continue to be a Victorian Medal, once the Patron's Medal, not to be given annually, but only occasionally, for geographical research.

The royal premium has been one great incentive to geographical discovery, for to win it is to win the blue ribbon of our science, and to be enrolled among men whose names will live in history. The seven first to receive it, in the Queen's reign, were Simpson, who completed the discovery of the northern coast of America; Sir Henry Rawlinson, our lamented President; Sir Robert Schomburgk, the value of whose surveys in Guiana were proved in the course of the recent arbitration;

* *Patron.*

THE QUEEN.

Vice-Patron.

THE DUKE OF SUSSEX.

President.

W. R. HAMILTON, F.R.S.

Vice-Presidents.

Sir John Barrow, Bart., F.R.S.
The Hon. M. Elphinstone.
G. B. Greenough, Esq., F.R.S.
Sir Woodbine Parish, F.R.S.

Trustees.

Sir G. Staunton, Bart., F.R.S.
Francis Baily, Esq., F.R.S.
John Biddulph, Esq.

Secretaries.

Captain Washington, R.N.
Rev. J. E. Renouard.

Ordinary Members.

Captain Back, R.N.
John Backhouse, Esq.
Captain Beaufort, R.N., F.R.S.
Captain Bowles, R.N.
W. Brockeden, Esq., F.R.S.
Robert Brown, Esq., F.R.S.
Colonel Chesney, R.A., F.R.S.
Colonel Sir A. Dickson, K.C.B.
Charles Enderby, Esq.
Colonel Fanshawe, R.E.
J. Baillie Fraser, Esq.
Bartle Frere, Esq.
W. J. Hamilton, Esq.
Colonel Jackson.
Captain Jervis, F.R.S.
Colonel Leake, F.R.S.
George Long, Esq.
James Meek, Esq.
James Morier, Esq., F.R.S.
Roderick I. Murchison Esq., F.R.S.

Lieut. Raper, author of the best work on practical astronomy; Lieut. Wood, the discoverer of the source of the Oxus; Sir James Ross, the great antarctic discoverer; and Governor Eyre, the Australian explorer, who is the father of our Medallists, and who still survives in a green old age. To several of our Medallists Her late Majesty graciously added other marks of her approval, specially for their geographical labours.

Our own diploma, given to students in practical astronomy and surveying, has certainly been welcomed by more than one department of Her late Majesty's Government, and has thus tended to carry out the Queen's wishes, expressed when she granted the royal premium, that geographical aspirations should be encouraged. We have instructed students in several professions and engaged in numerous occupations. The success of our scheme is proved by the number of royal and other awards won by our students, with the present Viceroy of India foremost in their front rank. But the majority have been officers in the army, and we may have the satisfaction of feeling that our efforts were made in the direction approved and desired by our beloved sovereign, for they are efforts to advance the efficiency of the "Soldiers of the Queen."

A review of the progress of geography during the late Queen's reign is a record of the fulfilment of the prophetic words of our Council in 1837; and on all appropriate occasions Her Majesty showed the deep interest she always took in that progress in all parts of the world. Such an occasion, among others, was found when Captain Speke returned from the discovery of the Victoria Nyanza in 1863. When our President, Sir Roderick Murchison, waited upon the Queen as one of the Royal Commissioners of the International Exhibition, Her Majesty congratulated him most graciously upon Captain Speke's great geographical feat, and, from the kind and emphatic manner in which the Queen expressed herself, Sir Roderick felt that she was truly proud in the reflection that two of her own gallant officers had succeeded in doing what the people of every other European nation had failed to accomplish. Captain Speke's premature death prevented his receiving a special mark of his sovereign's approbation; but her Majesty conferred honours upon his companion, and on Sir Samuel Baker who relieved them, for their geographical services.

I now propose to pass very briefly in review the progress of polar discovery during the Queen's reign, while the glorious record as regards other parts of the world will be in abler hands.

Polar Exploration during the Reign.

The first great polar achievement of the late reign was the discovery of Victoria Land by the Antarctic Expedition under the command of Sir James Ross, the most experienced of polar navigators. It was a memorable voyage, or rather series of voyages, and all its details are now receiving very close attention with reference to our forthcoming

expedition. The Queen conferred the honour of knighthood on the gallant and accomplished commander, and attention was then turned to the arctic regions, a part of the world in which Her Majesty had shown such special interest before her accession. Sir John Franklin's expedition sailed in the eighth year of the Queen's reign.

We no longer look upon the devoted zeal, the high-souled courage, and the heroic deaths of Sir John Franklin and his gallant companions as embodying one of the disasters of the Queen's reign. Those heroes are now among the *Dii majores* of explorers. They set examples which we hold up for imitation; their deeds invite successive generations to go forth and do likewise. Their expedition forms a turning-point in the history of exploration. They made the most remarkable arctic voyage on record, and discovered the north-west passage.

Then followed the search expeditions from 1848 to 1854, during which time many thousands of miles of coast-line were discovered through the zealous and persevering work of sledge travellers, working on the system developed and perfected by Sir Leopold McClintock. An immense addition was thus made to our knowledge. It is only necessary to compare the maps of the arctic regions of 1837 and 1857 to be convinced that a very great and important work of discovery was achieved by the officers of Her Majesty's navy in the interval. The period closed with a memorable event.

The *Resolute* was abandoned in 74° 41′ N. and 101° 17′ W. She drifted out of the ice, and was picked up by an American vessel 20 miles from Cape Mercy, in September, 1855. The Congress of the United States purchased this old discovery ship of Her Majesty, and resolved to repair and fit her out, in order to restore her as an offering of good will to the Queen. The *Resolute* reached Spithead in December, 1856, under the command of Captain Hartstein, U.S.N. Then Her Majesty the Queen, with Prince Albert, the two eldest princesses, and his present Majesty went on board the *Resolute*, and were received by Captain Hartstein. He informed Her Majesty that the vessel was restored by the President and people of the United States as a token of love, admiration, and respect for herself personally. As twelve years previously we saw the young Princess Victoria examining the routes about to be taken by Captain Back on an arctic chart, so now we find Her Majesty Queen Victoria, in the cabin of the *Resolute*, looking over the chart with Captain Hartstein, who traced for Her Majesty the drift of her exploring ship, and pointed out the discoveries of Dr. Kane, then quite recent. The Queen had not lost the lively interest taken by the Princess Victoria in arctic discovery.

But the search for Franklin was not yet completed. McClintock sailed in the *Fox* in the spring of 1857, and it remained for our illustrious Vice-President to weave together the story of a glorious achievement, and to secure for the memories of Sir John Franklin and

his followers the honours for which they died. We must not forget to mention, in connection with the voyage of the *Fox*, the name of Allen Young, whose remarkable journey effected the completion of the discovery of Prince of Wales island, whose generous and single-minded zeal led him not only to give his services gratuitously, but also to subscribe largely to the funds of the expedition, and whose subsequent valuable services in the two voyages of the *Pandora* were recognized by the Queen with a companionship of the Bath and a knighthood. All the excellent work done by Sir Allen Young was done at his own expense, influenced solely by single-minded zeal for a great cause and for the service of his Queen and country.

A period of fifteen years elapsed which were barren of polar progress, but when at last the Government once more resolved to despatch an Arctic Expedition in 1875, Her Majesty showed the interest she always took in polar discovery by granting an interview to Captain Nares, Captain Stephenson, and Commander Markham at Osborne. From a scientific point of view, the expedition of Sir George Nares was by far the most successful British Arctic Expedition during Her Majesty's reign. I, at least, have a right to say that its discoveries completed evidence which pointed to the true solution of the secrets of the Arctic Regions. Dr. Nansen's memorable expedition confirmed all the conclusions which were to be derived from previous knowledge, including the final and completing labours of the Nares Expedition.

The reign of Queen Elizabeth was as much signalized by the munificent generosity of her merchant princes in promoting geographical exploration, as by the actual discoveries of her gallant sailors. The names of Sir Thomas Smith, the founder of the East India Company, of Sir Thomas Roe, the great ambassador, of Sir Dudley Digges, of Sir John Wolstenholme occur to comparative geographers at once; those of Sanderson, too, and of Sir George Barne, whose gallant young descendant is about to join our National Antarctic Expedition.

But in this respect also the reign of Victoria emulates that of her renowned predecessor. Felix Booth equipped, at his own expense, the expedition of the Rosses, in the rescue of which her late Majesty took so deep an interest. It was under the auspices and at the expense of Charles Enderby that important discoveries were made in the Antarctic Regions. More recently, Mr. Leigh Smith, at his own expense, explored the coasts of Spitsbergen and Franz Josef Land; and we all remember how Mr. Alfred Harmsworth, entirely at his own expense, sent a well-equipped expedition to Franz Josef Land. It is due to him that the western half of that group was discovered by Mr. Jackson, ably and loyally assisted by Mr. Armitage, who, full of single-minded zeal, now goes out as second in command of our Antarctic Expedition. Nor must we omit the admiration due to the generous zeal of Sir George Newnes in despatching an expedition, under Mr. Borchgrevink,

to Victoria Land at his own expense. Mr. Borchgrevink was the first to put foot on Victoria Land, and he planted the British flag at the furthest south.

But foremost in this respect stands the name of Mr. L. W. Longstaff, whose act of unselfish and patriotic liberality does indeed remind us of the merchant princes of the days of old. The subscription of this old and valued Fellow of the Society put an end to doubts, and made our Antarctic Expedition a certainty. Mr. Longstaff's words, simple as they seem, are full of the fine spirit of chivalrous patriotism. "Being convinced," he says, "of the imperative need of the preparation of a British expedition, I have the pleasure to inform you that I have this day paid a sum to the credit of the Antarctic fund which I trust will meet the exigency of the case. As a Fellow of our Society for thirty years it gives me peculiar pleasure to be able thus to contribute towards the advancement of a knowledge of the planet on which we live."

The words are simple, but the deed is a great deed, placing the reign of Victoria quite on a par with that of Elizabeth as regards the munificence of the promoters of geographical discovery. Whence does this fine spirit of zealous patriotism flow, seen alike among those who encourage and promote, and among those who go forth for deeds of derring do? Can we doubt that no small part of the incentive to that devotion to duty which we see around us is due to the feelings of intense loyalty aroused and maintained by the example of our beloved Queen now passed away? Her memory will ever be fresh and green among us, because we shall constantly be reminded of the most perfect pattern that was ever set before a nation. I will conclude this poor and inadequate tribute by mentioning that the very last message to her Society, from our august Patron, was an expression of good wishes for the success of our Antarctic Expedition.

I will now call upon our Vice-President, Sir George Goldie, to review the progress of discovery and the expansion of empire during the reign of Queen Victoria, in America, Africa, and Australasia.

II. PROGRESS OF EXPLORATION AND THE SPREAD AND CONSOLIDATION OF THE EMPIRE IN AMERICA, AUSTRALIA, AND AFRICA.

By the Right Hon. Sir GEORGE TAUBMAN GOLDIE, K.C.M.G.

The part allotted to me this evening calls for the utmost exercise of your indulgence, for it is the survey, in thirty minutes or thereabouts, of the work effected during the last sixty-four years in the exploration, spread, and consolidation of the British Empire in an area of about ten million square miles, or about eighty times the area of the British Isles—a work to which I could only do justice in a long course of lectures. To-night a rough sketch, indicating salient

features, is alone possible; and if what artists call "the distribution of values" appears faulty, you will bear in mind that our special concern here is to regard matters from the geographical point of view.

In this survey the Dominion of Canada takes precedence, and the subject is peculiarly appropriate at this Commemorative Meeting, because the modern political history of "Our Lady of the Snows" dates from the first year of the Victorian age. It was within twelve months of Her Majesty's accession that Lord Durham landed at Quebec, as "Governor-General of all British provinces within and adjacent to the continent of North America." His famous mission resulted in the adoption (in 1840) of a rational principle of colonial policy—that principle of self-government which, a century earlier, might have saved to the Empire the great regions lying between Canada and the Gulf of Mexico. Lord Durham was a man of remarkable prescience. At a time when most other English great landowners still looked askance at railways, he recommended an intercolonial railway, as a means of bringing the Canadian provinces into line. With what pleasure would he have seen the great results already realized by the completion of that splendid enterprise, the Canadian-Pacific railway!

But Lord Durham also foresaw the development that would result from the granting of free institutions. Referring to this question of expansion in his report of 1839, he said, "The constitution of the form of government, the regulation of foreign relations and of trade with the mother country and foreign nations, are the only points on which the mother country requires a control. The privileges, carried to their logical conclusion, of representative government will do the rest." Certainly, under the old *régime* the two main instruments of the exploration and settlement of the vast area of the Dominion would have been wanting. The first of these was the creation of the Geological Survey of Canada, which under that modest title has carried its work over immense regions, and covered much more than the field of geology. Geography, botany, zoology, ethnology, and other branches of knowledge have alike shared in the benefits of this fine organization. Proposals for such a survey for Upper Canada had been pressed from 1832 onwards; but it was not until the concession of self-government that the project was carried into effect, in 1842, by the Provincial Government of the two Canadas, and Sir William Logan was appointed to organize and direct it. Logan resigned in 1869, and was succeeded by Dr. Alfred Selwyn, who held office until 1895, when he was succeeded by Dr. G. M. Dawson, whose earlier personal explorations in the Rocky mountains had made his name familiar to us on this side of the Atlantic. After the Federation of 1867, the Geological Survey extended its operations gradually across the continent to the shores of the Pacific. Although the scientific exploration of the Dominion, during the late reign, has been largely the work of the Geological Survey, we must not lose sight of the

important and independent work of the Topographical Survey, while it would be unjust to overlook the valuable part played by the Hudson Bay Company in its huge territory between 1837 and 1870, when it handed over its powers as a government. Nor must I omit to mention Captain Palliser's important expedition of 1857–58 (in and about the Rocky mountains), undertaken at the instance of this Society, which also awarded him its Gold Medal.

But scientific exploration could not have been consistently maintained, nor could it have served much practical purpose, if there had not been an army of hardy and energetic settlers behind it—and, at a later date, a mining population—ready to press into the newly opened regions; and it is beyond doubt that this development would not have taken place but for the combination of free local institutions with unity of central government which the Dominion of Canada enjoys.

At the commencement of the last reign the white population was 1,335,000; last year it was estimated at five and a quarter millions. I shall not give statistics of trade in 1837–38, because of the extraordinary discrepancies that exist between the two highest authorities of those days, Montgomery Martin and Herman Merivale, and there is no time to-night to try and reconcile their differences. But, in any case, the volume of trade then was insignificant compared with the 33 million pounds of exports and 28 million pounds of imports which the Dominion now shows.

There is no occasion to refer to our other possessions in the Western world, beyond mentioning the valuable geographical work of Sir Robert Schomburgk in British Guiana early in the last reign, and that of Mr. Im Thurn and others more recently.

The expansion of Australia during the Victorian period demands more detailed notice than that of Canada, because the southern continent had not a long antecedent history of exploration and settlement. It is very difficult to realize that the foundation of Melbourne was contemporaneous with the accession of Her Majesty, the earliest settlements in Victoria having only been formed in 1835; that the first settlers of the famous Wakefield Company only sailed from England in 1836 for South Australia, where Governor Hindmarsh, under a tree near the beach, read his commission to a small audience of emigrants and officials; that the then recently established Swan River Settlement (which afterwards became the colony of West Australia) was, in 1837, little superior to the settlement of Eden, as described by Dickens in 'Martin Chuzzlewit;' that Queensland was known only by its penal establishment at Moreton bay; that Tasmania, though somewhat better known and populated, owing to its insular formation, was in its infancy; and, finally, that New South Wales, our premier Australian colony, was, in 1837, still practically confined to the narrow strip lying between the ocean and the watershed of that mountain range which follows the

whole eastern coast and part of the southern coast of the continent. To compare the condition of Australia in 1900 with that in 1837, brings forcibly home to our minds both the unprecedented duration of the last reign and the rapidity with which our race can develop the resources of a new country when in possession of their greatest heritage—free institutions. But this advance of settlement had to be preceded by exploration; and the story of this in Australia derives a special interest from the terrible hardships often endured owing to the nature of the interior of the continent. During the eighteen years before Her Majesty's accession, some valuable expeditions—but all confined to the south-east corner of the continent—had been made by Oxley, Mitchell, Hume, Cunningham, and Sturt, the last of whom, through his later and greater work, earned the name of "the father of Australian exploration." But about the commencement of the Victorian age, a new impulse was given to the opening up of the continent by the fact that the southern and western coasts at last possessed settlements, so that the interior was attacked from three sides instead of from the east coast alone. Time permits only a brief reference to a few leading names out of a great number of explorers. In 1837 and 1839, Captain Grey, afterwards governor of South Australia, explored a portion of West Australia and claimed the discovery of ten rivers. E. J. Eyre, after preliminary inland travels in 1838 and 1839, made his famous march round the Great Bight, suffering terrible privations. In 1844–45, Sturt led the first Great Central Desert expedition to the very heart of the continent. At the same time, Mitchell completed his fame as an explorer by his Barcoo expedition; and Leichhardt travelled from the Darling Downs to the Gulf of Carpentaria. His subsequent journey in 1848, in which his entire party, including five other white men, disappeared for ever, is notable for the valuable search expeditions to which it gave rise. So it is that, whether in the polar seas, or in the heart of Australia, or in the deepest recesses of Africa, the disappearance of an explorer has often found its compensation in the progress of mankind by the energies called forth in solving the mystery. A. C. Gregory, who had explored the interior of Western Australia in 1846, and the Gascoyne in 1848, commenced in 1855 the series of travels in search of the Leichhardt party, which produced such valuable geographical results.

We now come to the efforts to cross the continent from south to north. I need not deal with all of these, nor with any at length, as they are within the memories of many of us in this hall. J. MacDowall Stuart's successful journey from Adelaide across to Van Diemen Gulf, Burke and Wills' journey from Melbourne to the Gulf of Carpentaria, and the terrible fate of this expedition on its way back, aroused much interest at home, as did also the work done by M'Kinley, as leader of one of the many expeditions sent out in search of the Burke and Wills party. The names of Forest (from 1869

to 1874) and Giles (1872 to 1875) must be added to this list of the leading explorers. It is important to note that exploration in Australia was quickly followed by settlement, wherever the nature of the country permitted it. An Australian writer has observed of the squatters, "these men and their subordinates were close on the footsteps of the explorers, and should the adventurer remain some months absent from civilization, he found, on his return, settlement far across what had been the frontier line when he departed." Here is again displayed the same spirit of individual effort in colonization which we noticed in the Dominion of Canada, and which differentiates our race from other races in modern days. Passing from exploration and settlement to the question of consolidation, it is unnecessary to make more than a passing reference to the Federation, which came into effect on New Year's day, only three weeks before the close of the Victorian age; for all that could be said on this subject has been quite recently said in the Home and Colonial Parliaments and press. Although the general review of the geographical and hydrographical work of the Royal Navy is, fortunately, outside the sphere marked out for me this evening, no story of Australian exploration would be complete without some reference to the celebrated survey of the entire coasts of the continent during seven years by H.M.S. *Beagle*, first under Captain Wickham, and after him Captain Stokes. She sailed from England only a few weeks after the accession of Queen Victoria. This voyage should not be confounded (as it often is) with the earlier voyage of the *Beagle* round the world, including a visit to Australia—a voyage to which we owe the delightful journal of Darwin. A few lines at the close of that journal seem appropriate to-night. Darwin wrote as follows: "In the same quarter of the globe, Australia is rising into a grand centre of civilization which, at some not very remote period, will rule as empress over the southern hemisphere. It is impossible for an Englishman to behold our distant colonies without a high pride and satisfaction. To hoist the British flag seems to draw with it, as a certain consequence, wealth, prosperity, and civilization."

The following figures will show the extent to which this prophecy has been already fulfilled: The white population in 1837 was about 131,000, the export and import trade with the United Kingdom was about two million pounds sterling; the entire exports and imports amounted to less than three millions; and the revenue collected in the colonies was under half a million. The white population is now estimated at over four millions; the combined export and import trade with the United Kingdom is nearly 45 millions sterling; the entire export and import trade of the six colonies before federation was about 130 millions sterling; and the aggregate of their revenues was about 27 millions.

With such a record, our brethren under the Southern Cross may well

be proud of that watchword which finds a heartfelt echo throughout the British Empire—"Advance, Australia."

The settlement of New Zealand, though no less remarkable than that of Australia, did not call for exploration on a large scale, inasmuch as no point in its islands is 100 miles distant from the seaboard; so that it does not offer the same material for geographical notice. It was not until after Her Majesty's accession that the occupation of New Zealand was commenced by the New Zealand Company, another creation of the indefatigable Wakefield. It is wonderful to note how, within a single reign, New Zealand has been made into a country almost as settled as England. The main cause has been, of course, the energy of the settlers; but a great debt of gratitude is due to Wakefield's Company, which carried on its valuable work until its dissolution in 1851. The existing Colonial Government was established by the Act of Parliament of 1852. Since that time exploration has been mainly carried out by the Colonial Survey under Sir James Hector and Sir Julian von Hoast. Here are a few figures showing the growth of the colony: In 1896, the population, exclusive of aborigines, was 703,000. The revenue in 1899 was nearly five million sterling. The export and import trade with the United Kingdom aggregate about 13½ million pounds, and the total exports and imports are about 20 millions.

Before leaving Australasia, British New Guinea, which was founded by an Act of Parliament in 1887, calls for notice at a geographical gathering, owing to the excellent work done by its late Governor, Sir William MacGregor.

I have decided to treat the subject of Africa very briefly. This is certainly not from want of material, either from the point of view of geography or from that of expansion of the Empire. Three or four years ago, our President, speaking in this hall on geographical exploration, said, "The continent of Africa was a vast blank on the map of the world in the year of the Queen's accession, and its subsequent exploration has been in great part due to the energy and liberality of this Society, of which Her Majesty is the Patron." Then again, as regards political expansion, it is certain that immense areas have been added to the Empire in that continent. Nor, again, can it be said that the progress of exploration and expansion in Africa has been steady and almost mechanical as in Canada, and therefore not presenting many salient points of interest. Just the contrary is the case. Owing to the vastness of the continent, to the immense native populations massed in some parts, to the climatic conditions, and finally to international and political causes, the story of British expansion in Africa is a long series of thrilling adventures, terrible hardships, sanguinary wars, and keen diplomatic struggles. It might seem, therefore, to call for treatment at considerable length. Nevertheless, there are valid reasons to justify a more concise method. In the first place, our political

expansion there is the recent outcome of a continuous and extremely heated international scramble, which—during the last sixteen years—has more than once brought Great Britain to the verge of a European war, and which wrung from Lord Salisbury the cry that Africa had been created to be the plague of Foreign Offices. It seems to me that one cannot now deal in any adequate way with that controversial history before a Society which, though never forgetting that it is a British Society, invites geographers of all nationalities to its meetings, and pursues the even tenour of its scientific and therefore cosmopolitan way in the acquisition, encouragement, and diffusion of geographical knowledge. In the second place, passing from political expansion to statistics, another result of the neogenesis of British Empire in Africa is that, for much of the territory acquired, statistics of revenue or commerce would be altogether misleading as a criterion of the potential values of these new possessions, while exact statistics of population do not exist, and mere estimates are very untrustworthy. For instance, in one province, Nigeria, some experienced travellers and geographers have estimated the population as high as 40 millions, and others as low as 20 millions. Even statistics of the area of British possessions are wanting in exactness, that area varying between $2\frac{1}{2}$ million square miles and $3\frac{1}{2}$ million square miles, according to the political points of view from which you choose to regard it.

Lastly, in regard to the geographical work of British explorers during the sixteen years since the scramble for Africa began—a work of immense detail performed by a great number of still living men—it would require more judgment (and certainly more courage) than I possess to draw a line between those who must be mentioned and those who must be excluded for want of time, while a long catalogue of names would be wearisome and serve no useful purpose. I propose, then, to deal only with the great preparatory explorations during the first forty-seven and a half years of the late reign, and to terminate with the momentous meeting of fourteen nations at the Berlin Conference towards the close of 1884. This story of exploration falls naturally into three sections, that relating to Western and Nigerian Africa, that relating to Southern and Zambezian Africa, and that relating to Eastern and Nilotic Africa, though the two last are, in a few cases, difficult to separate. I have put these three spheres in the chronological order in which they engaged public interest and support.

The discoveries of Mungo Park and Lander, the travels of Denham and Clapperton, and the enterprise of MacGregor, Laird, and Beecroft, had attracted much attention to Western Africa at the time of Her Majesty's accession. It was largely due to the Prince Consort that Parliament took up the question. The first effort was the Government expedition up the Niger in 1841–42, in the hopes of opening up relations with the populous and semi-civilized States in the region now

known as Northern Nigeria. In 1849 the Government proposed to attain the same object from the Mediterranean, and they dispatched Richardson with Overweg and Barth to Bornu, where the two former died. Barth then took command, and in the four following years made his celebrated journeys in the Central and Western Sudan. The Government next ordered the *Pleiad* to ascend the Niger and Benue, in command of Dr. Baikie, R.N., who, in 1854, reached a point not far short of Yola. In 1858, Lieut. Glover, R.N., afterwards Sir John Glover, ascended the main Niger in the *Dayspring* to Rabba, travelled thence to Boussa, and finally overland to Lagos. This was the last Government effort to open up those regions, and over twenty years passed before that work (to be coupled this time with the acquisition of political power, without which no advance can be permanently maintained) was again taken up and successfully carried out by private enterprise. But it must never be forgotten that this private enterprise would not have been conceived but for the information given to the world by the explorers of a previous generation. As the blood of the martyrs is the seed of the Church, so the expansion of the British Empire has, to a large extent, been the natural sequel to the lives and deaths of explorers whose labours may have appeared at the time to be unfruitful.

The exploration of Southern and Zambezian Africa during the Victorian age will always be associated with the name of Livingstone. His earliest visit to the Zambezi was in 1851; and the following year he started on the first great journey which made him widely known at home. It included the discovery of the Victoria falls, and the crossing of the continent from Loanda to the mouth of the Zambezi. So brilliant a success secured to Livingstone the support of the British Government and of this Society. In 1858 he started for his second great exploration, which lasted until 1864. He was accompanied by a young traveller, who was later to make the name of Sir John Kirk so familiar both as an explorer and as British Political Agent in regions much of which have since come within the circle of the Empire. The discovery of Nyasa Land, important as it has proved, was only one out of many results of these five years of constant effort. The subsequent labours of Livingstone, under the auspices of this Society, from 1865 until his death at Bangweolo in 1873, gain additional interest from the expeditions sent out to his relief, mainly under the auspices of this Society. The most important was that under Cameron, who, after he had convinced himself of Livingstone's death, crossed the continent from Zanzibar to Benguela. Two years before this, however, Livingstone had been relieved by Stanley, who thus laid the foundation for his subsequent work in the Dark Continent.

Of other explorers in Southern Africa, I will only mention Erskine and Elton (in the Limpopo and other regions) between 1868 and 1877,

and Joseph Thomson, who, on the death of Keith Johnston, directly after his landing in Africa in May, 1879, took command of his expedition, which had been sent out by this Society, and, after exploring Lake Nyasa and part of Tanganyika, discovered Lake Rukwa. But, apart from what we may call professional explorers, there have been a host of big-game hunters, to whom we owe much geographical knowledge of South Africa. Of these, the most famous is Mr. Selous, whose earliest thirteen years of wanderings, from 1871 to 1884, fall within the limit of time that I have set myself.

The explorations of Eastern and Nilotic Africa have attracted more sustained attention than that of either Western or Southern Africa, and they have been, for the most part, connected with this Society. Burton and Speke were despatched in 1856 to discover the great lakes reported to exist. Burton mapped out the northern half of Tanganyika, and Speke discovered the south shore of the Victoria Nyanza. In 1860 Speke was again sent, with Captain Grant, to discover the sources of the Nile. They reached the western shores of the Victoria Nyanza, found the outlet of the great river, and followed it down to Gondokoro, where they met Baker ascending the White Nile, after he had explored the regions of the Atbara and the Blue Nile. Baker, proceeding southward, discovered the Albert Nyanza, which had been missed by Speke and Grant. It is impossible to do justice here to the multitude of explorers who have contributed valuable information on the Egyptian Sudan and neighbouring regions; but a passing reference must be made to the first opening up of Somaliland in 1883, by Messrs. James, Alymer, and Lort-Phillips—a work which has since been so ably extended by Dr. Donaldson-Smith and other notable explorers.

I must now pass to the new era opened by the great journey of H. M. Stanley from Zanzibar to the mouth of the Congo in the years 1875 to 1877. Only the earlier portion of that memorable journey falls within what is now a part of the British empire; but Stanley's great discoveries were the torch that fired the dormant idea of developing and settling equatorial Africa. Although some years elapsed before that smouldering fire burst into flame, there were a few minds in Europe who saw that the partition of Africa was approaching, and who set to work to prepare for it, so that when the moment came, in 1884, they were ready to act instead of losing years in deliberating and creating the necessary organization. During that period of incubation, the Royal Geographical Society displayed great activity in sending out expeditions entirely at its own expense. The most important was that led by Joseph Thomson through the Masai country in 1883–84, in which he succeeded in reaching the north-east coast of the Victoria Nyanza, and also visited Mounts Kenia and Kilimanjaro. About the same time, the latter of these was explored and ascended by Mr. H. H. Johnston, who had previously visited other parts of Africa. I specially

introduce his name because, as Sir Harry Johnston, he has proved himself a brilliant administrator in British Central Africa, and is at present engaged in organizing a system of government for that great province of Uganda, which Captain Lugard (now General Sir Frederick Lugard) won for the Empire under the auspices of the Imperial British East Africa Company.

This ends my sketch; but I would add a few words on a question which the future historian will assuredly ask:—In what spirit has this vast expansion of the Empire been conducted?

Now, looking only at British America, Australasia, and Africa, because British India is outside my province to-night, these fall roughly into two sections, one of which is mainly peopled by white races capable of self-government, while the other is peopled by coloured races, which (when unprotected) fall a prey to cruel tyranny and inhuman fetish practices, or are devastated by unceasing inter-tribal war, or are swept away by the incursions of slave-raiding hordes.

Throughout the Victorian age, Great Britain has dealt with the white races on the principle of constitutional liberty, when assured of loyalty to the Crown and flag; and the chief aim in dealing with the coloured races has undoubtedly been beneficence, though this aim, like other human ideals, has too often been marred by imperfect knowledge or faulty judgment. But perhaps the dominant note throughout this period of expansion has been the devotion to duty of those concerned in it, whether soldiers, sailors, or civilians; whether in the United Kingdom or in the Colonies; whether explorers of unknown regions or their supporters living within the bounds of civilization.

And it was that triple watchword of Liberty, Beneficence, and Duty which made our late Sovereign the perfect symbol of the cohesive forces that bound this vast Empire together; her respect for the constitutional liberty of her subjects was only equalled by her deep human sympathy with all kind of suffering, and by that extraordinary devotion to duty, which was carried to the very verge of the grave. So it was that Her Majesty stood as the type and example of all that is best and truly greatest in our race: and as long as English history shall endure and wherever the English language shall be spoken, the last Sovereign of the Hanoverian line will be revered by our descendants as Victoria the Beloved.

III. ADVANCES IN ASIA AND IMPERIAL CONSOLIDATION IN INDIA.

By Colonel Sir THOMAS H. HOLDICH, K.C.I.E., C.B., R.E.

When we turn from the magnificent record of geographical enterprise, closely associated, as it has been, with the advance of Imperial interests in Africa during the last sixty years, to the records of progress in

scientific research in Asia, we may at first be struck by a sense of disproportion in the extent of the results attained. Here are no vast bands of forest and mountain, no continental widths of plain and morass, to be traversed for the first time in the history of the world's research by the wearied feet of the geographical pioneer, but a very, very old world indeed, a world so old that its intermittent phases of past civilization have been utterly lost in the sleep of oblivion, and it is for us, the geographers of the present day, to dig out their skeletons and to reconstruct from the fleshless bones the full outline of its former development. There is, indeed, little analogy between Africa and Asia. Our most venturesome and intrepid explorers for the last half-century have but followed the footsteps of Old World travellers, and told a tale which must have been told centuries and centuries ago. We have but restored to the world what the world well knew once before, but we have restored it in a form which precludes the possibility of any further relapse into obscurity. We have given the geography of Asia a scientific basis and a constructive anatomy which must last as long as the world lasts; and thus the old, old continent takes new shape, shedding its mantle of mystery, whilst it is finished and fashioned and fitted with all the latest improvements by the modern map-maker.

In the year of grace 1837, when our late Queen ascended the throne of England, Russia was still behind the Caucasian barrier; Persia and China were for the most part regarded with Arabia as regions of speculative inquiry; High Asia was a nebulous sea of uncertainty, with the face of its past civilization battered beyond recognition by the destructive Mogul; Siberia was a boundless waste of snow-covered steppes where desolation reigned supreme, and men went as to final perdition, without hope in this world, and no promise of a comfortable exit into the next. Such, at least, were the popular views of the geographer of 1850, and I am old enough to remember something of their nature in the early days of my boyhood. Nothing has changed except men's knowledge; and this has grown with the growth of empire, of Russian Empire and of British Empire, till the wildernesses and deserts of our imagination have blossomed into fields and prairies, and the wealth which our ancestors passed by unheeded is enriching the world.

All this has been brought about by the slow and certain process of Imperial advance, carrying with it all the accessories of civilization, which sweep clean the rottenness that underlies the undergrowth of small and semi-barbarous nationalities choking their roots and stunting the growth of wide and wholesome development; and it is this which has distinguished Asia no less than Africa in the history of the world's advance during the last century. But, coincident with this advance, and due to it, very much has been done to make the byways of the Old World plainer to those who study them, so that they may read on

the face of the map as they run, and not involve governments in grievous geographical blunders. There is hardly a corner of Asia which has not been visited and examined and mapped during the last fifty years. The researches of Doughty and Bent and Blunt, in Arabia on the west, have been balanced in the far East by such a host of determined far-searching explorers that it is impossible to enumerate them. The names of Gill, of Margary, of Baber, Colquhoun, Younghusband, Bell, Woodthorpe, and Glass, will occur to you all. They are sufficient to sustain the reputation of Englishmen as foremost in the geographical field of eastern Asia. An immense mass of information has been collected and collated by these members of our Society. They have unravelled the riddle of Eastern hydrography in its early beginnings, showing us where the Brahmaputra, the Irawadi, the Salwin, the Mekong, the Hoang Ho, and the Yang-tsi trace their sources; they have unfolded the magnificent resources of Central China, and proved the possibility of reaching them from India; they have set a definite line of partition between British and French interests in the Far East; and they have mapped out the world of mountains between Assam and Lower Burma. The far north of Asia has yielded up all secrets worth knowing to the patient, unwearying persistence of Russian explorers and Russian surveyors, and it has been for us Englishmen to keep pace in the south with the advance of Russian scientific expeditions in the north; to take up, as it were, the geographical glove which has been cast at us from beyond the Himalaya, and see to it that we were not outpaced in the search after knowledge. We have no reason to be ashamed of our share in the scientific contest. Into the central region of vast elevations and depressions, whilst we have watched with admiration the advance of such giants in geographical exploration as Prjevalski and Sven Hedin, we Englishmen have sent a very creditable contingent of inquirers. The names of Shaw and Hayward, the Stracheys, Trotter, Dalgleish, Bower, Littledale, Younghusband, Wellby, Ney Elias, Curzon, Conway, Deasy, are all familiar enough to this Society and to the world. Through them, and others like them, we have learnt all that there is to know of the general physiography of High Asia, including that land of ancient mystery, Tibet. And to these names there are yet others to add which are not so well known, the names of those patient workers in the geographical cause who have been sent out from time to time from India across the great chains of Himalaya by the administrators of Indian Survey Department; natives of the country (sometimes natives of the very land they set out to explore); men who have faced all difficulties and braved all dangers, who have been to Lhasa and mapped it as if it were London, and who have carried through their work from end to end a well-connected chain of scientific observation, incorporating the whole into an accurate record of trans-Himalayan geography. Amongst them we may select the names of Nain Sing and Krishna as

typical workers. Now all this great advance in what we may rightly term scientific geography has occurred not only during the long reign of our late Queen, but well within the latter half of it, and it could never have assumed the high value which we may fairly claim as its due (a value which we measure by the standard of accuracy rather than of extent) had there not been a sound and assured basis of accurate geodetic deduction from which to start. For this we must turn to India.

What was our geographical position in India in those comparatively early days of the century just passed away, when our great Queen first assumed the responsibilities of monarchy?

Take any map of India that existed before 1840, and you will see it plainly marked. Draw a line from the head of the Gulf of Kutch, on the western coast, due northward till it reaches a point about level with Sukkur, on the Indus, where the great cantilever bridge now spans the river and carries the North-Western railway across it. From this point slant the line north-eastward till it hits the upper reaches of the Sutlej river below the Himalaya, and you will have a fair presentment of the north-west frontier of India in the days of Lord Auckland. Beyond it lay the unlimited flats and sands of the Punjab and Sind, so little known that we find written across the blank space intervening between the Sutlej and the Ravi, "Here dwell an erratic people called the Khattia." But with all the geographical uncertainty that overlay these regions beyond the frontier, there were here and there districts and positions which were not inaccurately laid down. The valley of the Kabul river, for instance, the historical high-road of the conquerors of India, is not vaguely expressed; and the position of the main passes across the frontier hills is relatively maintained throughout, although the names are misplaced. When the gallant Wood set out on his voyage of exploration up the Indus and terminated his quest at the Lake of the Pamirs to which he gave the name of his young Queen (a name which, through the courtesy of Russian geographers, is to be retained through future years by a lake which is now half Afghan and half Russian), he was received with suspicion. Coming events were even then casting long shadows before. In 1843 Sind was annexed. Within the next ten years the red line had passed round the Punjab, had included the Berars in Central India, and had encircled Lower Burma on the east. In 1856 Oudh was coloured red; and finally, after a long, long interval, Upper Burma joined us in 1885. Thus since 1840 six great provinces, covering 450,000 square miles of country and including fifty million of people, were added to India.

The great peninsula of India during this period has been gradually reduced from a condition of geographical vagueness to that of detailed map accuracy. There was in the year 1840 a vast space of the interior lying between the Godavari and the Bay of Bengal across which was written the word "unexplored"—and so indeed it remained absolutely

unexplored, along with many other minor tracts, a region of absolute darkness, until the seventies, about which period we may say that all geographical uncertainties were cleared up, and Indian exploration became a thing of the past. Meanwhile there had been growing up to perfection a system of minutely accurate geodetic survey, which has finally covered India with a network of triangulation second in scientific value to none in the world, which has furnished a basis for extension of accurate geography westward into Persia, Baluchistan, and Afghanistan, and northward to the Oxus and the Pamirs, and which has, in a secondary degree, supplied that data which was necessary for the scientific exploration of all High Asia. And with this grand development of practical geodesy, as much as with the scientific acumen which first saw the advantages to be gained from a system of exploration conducted by natives of the country based thereon, must ever be associated the name of my late chief, General Walker. To him, not as a great pioneer in the field of exploration, but as the guide and adviser of all pioneers, the constructor of a system on which such pioneering might be based with the result of assured accuracy, the friend and councillor of this institution, and the warm supporter of all geographical enterprise, I would award the first place in that great roll of English geographers who have maintained the honour of English science in Asiatic fields.

It seems fitting that on an occasion like this we should call to mind some, at least, of the names of those who have been so closely associated with this great Society, and whose voices we shall hear no more within those walls. Of the living I need not speak again. We have them with us, and we trust to meet them often; but to those who have crossed the last boundary into the great unknown lands we may well give a passing tribute of unforgetfulness. Along with Walker we have lost many whose names were well known on the list of Indian surveyors—Basevi, Montgomerie, Tanner, Harman, that gallant explorer Woodthorpe, McNair, and many another less-known hero have passed us by; Theodore Bent has left the fields of Arabia and Africa; Elias will no more tread the steppes of Central Asia, nor Wellby; Hayward has gone, and with him that later adventurer into the stern altitudes of the Himalaya—Mummery. These all rest from their labours, and their work is done.

And what are we to say of such lights of Asiatic geography as Rawlinson and Yule? Such names as theirs will never die. They will echo down the roll of ages for century upon century. Their works are their monuments, and that work which they lived to accomplish is a work which yet speaks and gives life to geographical enterprise.

I have been asked to say something of the consolidation of the British Empire in Asia. For its material consolidation we must look to those physical changes which the addition of territory and the

enlargement of its borders bring about. For that consolidation which means unity of purpose and bond of sympathy between the many nationalities of which India is composed, we must look to the condition of the people under new developments of civilization, and to their loyalty to the throne.

I have said that since 1840 six great provinces and a vast number of people have been brought under British dominion, until the total area of British India is measured by one million of square miles of territory, peopled by 200 million inhabitants. The Presidencies of India exist no more, British India is now represented by eight provinces, each under its own administrative staff answerable to one supreme head, the Viceroy of India. Within it, each under its own native administration, are a multitude of native states enjoying various degrees of independence, and these collectively represent about another half-million of square miles in area, and from 50 to 60 millions of people. Beyond this again there stretches a great area of trans-frontier country, Baluchistan and the independent districts of the Pathan border, reaching to the frontiers of Afghanistan, which must be regarded as being independent only in the sense in which the native states of the peninsula are independent. It would take more time than is at my command to define the exact degree of independence claimed and exercised by each, but it is well in these days to remember and to recognize the actual facts of that independence, and to bear in mind that for the last forty years no material shifting of the red line westward has taken place. Where the stern old Sikh drew his frontier line at the foot of the hills, there (in spite of the fact that we occupy advanced posts, and are in strength on certain strategical lines) is our frontier still. Only in Baluchistan have we definite official footing on the red patch which centres about Quetta, and which we call British Baluchistan. It is in the east, in Upper Burma, that the great material change of extension of territory is most boldly marked. But whilst the peninsula of India extending to Burma is the visible expression of British Empire in Asia, we must regard its consolidation as dependent on the measure of our capacity to govern and to defend it; and this means a sure and determined hold on the borderlands between ourselves and Russia, or between ourselves and France. So that the measures which have been recently taken to define the exact limits of Persian, Russian, Afghan, or French spheres of influence respectively by the demarcation of boundaries must be regarded as so many factors in effective consolidation, just as much as should the occupation of those military posts and strategic positions which leaves the command of frontier avenues of approach in our hands. No empire can be consolidated which leaves a ragged border of indefinite sovereignty on its edges subject to perpetual political wrangle and dispute. Here, then, surely we have nothing with which to reproach ourselves. If

the past century has brought with it great additional responsibilities and a widening Imperial sphere, it has also seen a definite limitation set to any unjustifiable thirst for extension of territory, and a rounding off of the area of Imperial responsibilities which can but make for peace and settled government.

But the consolidation of an empire is not merely a matter of physical definition. That unity of sentiment amongst many peoples, which can only be brought about by good government, by the exercise of the qualities of justice and mercy, by the gradual increase in the material welfare of the millions, by their final contentment and acknowledgment of the success of our efforts in their behalf, is yet more important. What have we done for India by the introduction of perhaps the most successful scheme of administration that the world has ever seen? Is India the better for us, and are the people united and happier?

It would be easy enough to turn to the pages of blue-books and produce evidence of the extraordinary march of Indian administration; to trace out the steps whereby the cumbersome processes of government under the company which gave India to us have gradually given way to the present system, a system which is only made possible by railways; and to prove that the policy of decentralization, which has been the keynote of Indian administration for the last twenty years, has been the only one which could deal successfully with the problem of binding twenty different nationalities with as many different tongues into one compact and enduring empire.

We could then speak of the developments of civilization; of thousands of miles of roads where roads never existed before; of hundreds of square miles of irrigated land where there was nothing but wild waste; of railways whose united length would encircle the globe; of the creeping, growing change that these things are effecting in the caste prejudices of the people; of the transition from the India of tradition, the India of jungles and thatched bungalows and slow movement, to the India of the self-complacent globe-trotter, of flats, and hurrying, dusty, week-end skirmishes to and fro.

If material advance is to be measured by revenue, then it is satisfactory to record that the gross revenues of India, which in 1837 amounted to 21 million in pounds sterling, can now be reckoned at 95 millions, reckoned in tens of the depreciated rupee. How far that depreciation has affected the growth of empire, we cannot at present inquire.

But it is the people, after all, the silent, sullen people, who make the empire, and it is to them we would rather turn for illustration of the moral and material advance that India had made. That they are much better off (in spite of famine and pestilence) than they were, is a self-evident fact to any one who has had opportunity to study them in any one locality for a decade or two. Better houses, better clothes,

brass pots instead of earthenware, silver bangles twinkling on the women's arms and ankles,—all these things are the outward and visible sign of increase of material wealth, and they are evidences which can hardly be misinterpreted. They are at least abundantly manifest in all those parts of India where European civilization reigns. Amongst the 180 millions of agriculturists who form the bulk of the population of India, there must be times when scanty crops and consequent famine reduce vast multitudes to great destitution. But for all that, the normal condition of the Indian peasant, as that of the landowner, is vastly improved under our rule. It is well to remember the words of Strachey: "There has never been a government of India that has taken from the people so small a share of the profits of the soil as ourselves, and this is true for every province in India." If, as some seem to think (but as I do not think), the people of India in the mass are not contented and the happier for our rule, surely, in the words of another great statesman, they "ought to be." If we turn to the educated classes, we have no reason to despair. There are at least thousands of natives, men of intellect and wide influence, wise with the wisdom of the West as well as of the East, who point to the universities and the schools now existing in every part of the country with pride and confidence, and who amply justify the hope that our methods of improvement, our efforts towards the diffusion of knowledge, will yet avail as a strong support in the construction of empire.

But the strongest expression of that unity of nationalities which means a consolidated empire is not to be found in mere contentment of a people with their surroundings, or in the evidence of material advancement and wealth. It is unity of sentiment, the bond of common sympathy evoked by the call of a common allegiance to their ruler, which is the best guarantee for continued Imperial soundness, and without which no empire can hope to stand. In a word, it is the loyalty of the people to which we must look.

Are the people of India loyal, and if they are, to what extent has the influence of the first great Empress of India, our late Queen, been directed in its development?

Consider what India is. Remember that there must be 40 to 50 millions of people in that but half-known land who have certainly never seen the gleam of a bayonet or the face of a British soldier, and many of whom can never even have seen a white man. Can such a sentiment as loyalty be evoked in the breast of these half-reclaimed savages of the jungles? I think it can. I do not speak as a political economist—merely as an ordinary observer, who has walked and talked with the people of India for thirty years in their hills and jungles and plains, and has learnt a little of their moods and methods. I say that loyalty is an instinctive and natural principle implanted in the breast of every native of India. But it is the loyalty of personal attachment

to his ideal. A native will be loyal to his chief, loyal to his mulla, loyal to his friend, or loyal (ah! how loyal many of us can say) to his master or mistress; but he must have a clear definition, if an ideal one, of the attributes of the object of his loyalty. His mind must be clear, though his conceptions may be utterly wrong. Thus the wretched jungle woman who propitiates the goddess Mata (the beneficent mother who comes with small-pox in her hand to carry away her child), and builds little swings by the roadside with scant offerings of rice or turmeric to persuade good Mata to deal gently with her, would offer her starved and battered heart in an ecstasy of adoration to the great Queen-mother, her Empress, with her womanly sympathies and her royal condescension, were there but the outward and visible presentment of sovereignty to fall down and worship. But she doesn't understand the Sirkar, the Government of India, which may indeed exist in high altitudes on the mountains of the north, but which shows little active interest in her poor struggle for life, if so be, indeed, that she has ever heard of the Sirkar at all.

A little higher in the scale of Indian humanity—amongst the swarming millions of agriculturists and the so-called educated classes, the zamindars and the mullahs, the priests, the babus and the Mohammedan pleaders, how much is there of real loyalty to the throne? I believe that the great mass of them are loyal by instinct and by tradition. They have known no government that was not a foreign one, and to them the freedom of republicanism is incomprehensible. Although education has advanced far enough to have induced a discontent which, amongst a certain section of the noisiest of them, takes the form of a simmering overflow of disloyal sentiment in their infant press, I believe this to be absolutely superficial. Their own literature, such as it is, teems with tales of regal splendour and magnificence, and captures their imagination by stories of royal condescension, of kings and kalifs descending to walk amongst their people and distributing a vicarious and ill-considered justice by royal command. It may be said that this is a sentiment only. If so, it is a sentiment which has pervaded all India, and which still wraps the throne in a mantle of idealism, still places loyalty to a living chief above all family affection and ties, and this sentiment I believe to have been warmed from a dead acquiescence in the rule of the Sirkar to a living, moving faith, since first a living Empress has been given to the people. What else was the meaning of the voices of prayer which went up from thousands of mosques and temples through the length and breadth of the land that our Queen might be safeguarded from death and restored from illness? The small voice of sedition was still then. There was never any real life in it.

For that great company of native chiefs and nobles who have shown their loyalty and devotion to their Empress on a hundred fields, I need answer no more than I need for the army of India. Strange indeed

would it be if the devoted loyalty of the British soldier (a loyalty which is a passion) had found no echo in the ranks of his fellow-soldiers who have fought shoulder to shoulder with him through the campaigns of an Empire. But, in truth, the quality of loyalty is not caught by contagion in India. It was always there, the hereditary possession of a race of soldiers who, so long as they can see and know whom it is that they serve, will serve with all the hereditary valour of their race. But with them, as with all the rest of us, the dead sentiment is quickened into life, and loyally springs from the head to the heart, when the visible object of it is wholly worthy, Imperial in dignity and power, yet claiming human sympathy even as that sympathy is given. I have ridden many a long day's ride with a simple Mohammedan soldier who, to his eternal satisfaction, had been selected as a representative of the Indian army at our late Queen's jubilee. I knew that he had ridden with the Prince of Wales through many a magnificent pageant, that he had seen all that London had to show of England's wealth and power. Yet of all these wonders (for wonders they were to his simple mind) he had not a word to say; but he had everything to say of the gracious lady, *his* Queen, who had spoken to him five kind words and touched the hilt of his sword, who ever had at her side a man of his own faith and kin in attendance, who could speak his language *as a lady should speak it*, and who had even learnt to write it. His gratitude and his admiration were unbounded. Loyalty with him had become a life's faith. It was his Empress who existed for him for ever as the guiding-star of his devotions in camp or field.

I have not forgotten the mutiny or the lesson of unfaithfulness that it taught us. But I remember two facts in connection with it. Firstly, the people of India were hardly touched by the disloyalty of the army; and, secondly, that the army which mutinied was not composed of soldiers of the Queen. It may be said that faithfulness to a throne is the same thing as faithfulness to the executive government, which may happen to represent the throne. Loyalty to the one is loyalty to the other. It is so, but with a difference. I ask you, brother officers, who for many years have stood up to listen to that simple toast which is ever received with a silence that is eloquent, and which, alas! we shall hear no more with the old significance—"Gentlemen, the Queen;" should any mess president have deemed it wise to substitute the words, "Gentlemen, the Indian Government," would it have been the same thing to you or me? Hardly. And how should we expect it to be the same with the soldier of India? And it was the just appreciation of the true meaning of this difference, representing as it does a deep-rooted human principle, that prompted the wisest statesman of his time to give to the Empire of India a living Empress, to claim the hearts of the people as well as their heads, and thus to bind an Empire together with ties of a common sympathy and personal loyalty. I believe that

the keystone to the Imperial structure was set on that first of January, 1877, when our Queen was proclaimed Empress of India, and I believe that the bright clear light of her royal dignity, of her Queenly condescension, and of her womanly sympathy, has so bound together the sympathies of all the scattered nationalities of the East, that men shall say through all future time, "This was a consolidated Empire indeed, for it was built up on the hearts of the people."

IV. PRESIDENT'S ADDRESS ON THE ACCESSION OF KING EDWARD VII.

His present Majesty has received from us, as he will receive from all his subjects, the most sincere and most respectful congratulations on assuming the heavy burden of empire. All his subjects bear in mind the work of His Majesty as Prince of Wales, characterized as it was by untiring and unceasing devotion to duty, by unflagging industry, by great ability and perfect tact and judgment, and by warmth of heart. These high qualities accompany him as King; and we all loyally and earnestly wish that, following in the footsteps of his august mother, he may long be spared to the Empire as a great and wise constitutional Sovereign.

As Prince of Wales, His Majesty succeeded his revered father as Vice-Patron of this Society in the year 1862; and His Royal Highness made it no honorary post, but took a warm interest in our proceedings, was present at our meetings, and performed official functions on several occasions. In alluding to the Prince's gracious acceptance of the post of Vice-Patron, Sir Roderick Murchison truly said that no other heir apparent ever before made himself so good a geographer by extensive travels. The Prince of Wales was pleased to express great gratification at becoming our Vice-Patron, particularly as it was a post which had been occupied by his revered father.

The first great event after the Prince accepted office in our Society was the return of Captain Speke from the discovery of the Victoria Nyanza. Although His Royal Highness was unable to attend our very crowded meeting, he was so much interested in the discovery, that a special arrangement was made for Captain Speke to read his paper again at the Royal Institution, when the Prince could be present.

In 1869, in accepting an invitation from Sir Roderick Murchison to be present at our Anniversary Dinner, the Prince of Wales said, "Nothing will interest me more, or give me greater pleasure, than attending the dinner at which you preside. I have taken the greatest interest in the grand project for the exploration of Equatorial Africa."

During the tour of the Prince and Princess of Wales in Egypt, their Royal Highnesses were accompanied by Sir Samuel Baker, and the Prince interested himself most deeply in the question of suppressing

the iniquitous slave-trade of the upper Nile. It was through His Royal Highness's personal interference that such arrangements were made by the Khedive as induced Sir Samuel Baker to command the expedition, the fruitful results of which are so well known. At our meeting to welcome Sir Samuel Baker on his return, on December 8, 1873, the Prince of Wales took the chair, and made a speech of welcome to the great traveller on the part of the Fellows. His Royal Highness also became the Patron of our African Exploration Fund.

I mention this to remind you what a hearty and active interest His Majesty, when Prince of Wales, was accustomed to take in the affairs of our Society. His Royal Highness took a similar interest in our arctic work. He was present when the paper was read announcing the despatch of the Arctic Expedition of 1875, showing the great interest he felt in polar discovery, and giving encouragement to the gallant officers who were about to face the hardships of arctic service. On their return, the Prince of Wales took the chair at our meeting to welcome them, on December 12, 1876, and moved the vote of thanks to Captains Sir George Nares, Stephenson, and Markham, for their papers, concluding his speech with these words: "I ask you, ladies and gentlemen all, most enthusiastically and most cordially, to give the arctic leaders that hearty British welcome which they have so thoroughly deserved."

The Prince of Wales was again present at our meeting when Sir Henry Stanley read his paper on February 7, 1878, as well as on the occasion of the same traveller's reception at the Albert Hall in May, 1890. It will be still fresher in the memories of the Fellows of this Society how His Royal Highness dined with our club and attended the great meeting in the Albert Hall on February 8, 1897, for the reception of Dr. Nansen. At the request of the President and Council, the Prince of Wales performed the office of presenting to Dr. Nansen the medal which had been specially struck in his honour. The last time that His Royal Highness honoured us with his presence was on May 16, 1898, when we celebrated the fourth centenary of the voyage of Vasco da Gama. In addressing the meeting, the Prince said that he thought it most appropriate that we should join with Portugal in celebrating the fourth centenary of a voyage which had had so marked an effect on the history of the world in general, and of our own country in particular.

Perhaps it was scarcely necessary to remind you of the numerous occasions on which our Vice-President showed an interest in the work of our Society during the thirty-nine years that he has held that office. We now trust that His Majesty will be graciously pleased to accede to our request, and to become Patron of the Society in succession to his revered and illustrious mother, our late beloved and lamented Queen. His Royal Highness the Duke of Cornwall and York has also been

graciously pleased to attend several meetings of our Society. The Duke accepted the office of Honorary President of the Sixth International Geographical Congress in 1895, and delivered an admirable speech of welcome to the geographers from all the countries of the world, at the opening evening meeting. We trust that His Royal Highness will be pleased to accept the offer of Vice-Patron of this Society, in succession to his father.

His Majesty the King is Patron of our Antarctic Expedition, and I am sure we all confidently hope that its young and very able commander will illustrate the opening reign of Edward VII. by his contributions to geographical science, as Sir James Ross did that of Queen Victoria. Such patronage will not fail to be a great encouragement to officers and men.

We all most earnestly hope that not only geographical discoveries, but successes of all kinds, may brighten and render famous the reign of King Edward VII., that every blessing may attend him, and that he may long be spared to reign over a loyal and united people.

God save the King.

EXPLORATION IN THE CANADIAN ROCKY MOUNTAINS.*

By Prof. J. NORMAN COLLIE, F.R.S.

In February, 1899, I read a paper before this Society wherein I described two journeys, one taken during the summer of 1897 with Mr. G. P. Baker, and one with Messrs. H. E. M. Stutfield and Hermann Woolley in 1898. During these journeys we explored the eastern side of the Canadian Rocky mountains for a distance of nearly 100 miles, from Laggan on the Canadian Pacific railway to the sources of the Athabasca river. One or two explorers had been through the country before—Dr. Hector, Prof. Coleman, and Mr. Wilcox—but they had for the most part followed the valleys; few attempts had been made to investigate the great snow-fields and the surrounding peaks that form the backbone of the country. We penetrated into the very heart of three out of the four great plateaus of ice and snow—the Wapta, the Freshfield, and the Columbia *névés;* also by ascending some of the high snow-peaks near to these central reservoirs of ice, we were enabled to obtain considerable knowledge of the whole range.

The Columbia ice-field is by far the biggest accumulation of glaciers we have yet seen. It covers an area of at least 100 square miles; moreover, from a geographical point of view it claims additional interest, for it is the source of the great rivers, the Athabasca, the

* Read at the Royal Geographical Society, January 14, 1901. Map, p. 332.

MAP OF CANADIAN ROCKIES.

Owing to the failure of the lithographers to deliver Professor Norman Collie's Map of the Canadian Rockies in time, its issue is postponed till the April number of the 'Journal.' In binding the volume, it should be inserted at p. 332.

Saskatchewan, and the Columbia. Also, probably some of the highest peaks in the Canadian rockies, Mount Columbia, Mount Alberta, and Mount Bryce, surround this desolate spot. Another peak, the Dome, situated near its centre, on whose summit we stood in 1898, is probably the only mountain in North America the snows of which, when melted, feed rivers that flow into the three oceans—the Atlantic, the Pacific, and the Arctic.

Although, therefore, we had obtained a fair knowledge of the eastern side and the centre of the range, yet to the west an unknown country lay. What was there on the other side of the Freshfield, the Lyell, and the Columbia groups? Were there great glaciers and further outlying mountains? Did the valleys run straight to the Columbia, or, like those on the eastern side, lie parallel with the range? Were the bottoms of these valleys underneath the high mountains three, four, five, or even six thousand feet above sea-level, like those on the opposite side? and were there any passes over which an easy trail might be made? Some vague knowledge of these western mountain fastnesses had been acquired from the summit of Mount Athabasca (11,900 feet) by Woolley and myself in 1898. West of Mount Forbes I had seen a high mountain with glaciers on its flanks, and tipped with ice and snow. South of Mount Bryce there seemed also a gap in the range, darkened by dense woods, that apparently led from the west branch of the north fork of the Saskatchewan over the divide, to the lonely valleys of the west. Another high peak reared its head far into the sky westward of Mount Columbia; and the immense expanse of the ice-field between Mounts Columbia and Bryce was seen gradually bending down westwards to a deep green valley filled with pine woods and leading in a southerly direction, whilst far away over several ranges of lesser peaks we thought that we could see the valley of the Columbia running north-westwards parallel with the mountains.

After we had returned to Banff, Stutfield visited Donald to inquire about the possibilities of getting down this Columbia valley. He was told that a pack trail had been cut as far as Boat Encampment, or, as it is now called, the Big Bend, this trail being used by prospectors and others going to Tête Jaune Câche and the headwaters of the Fraser river. But he could obtain no information about the land that lay between that trail and the main chain of the mountains. He, however, made up his mind that if it were possible to cut a trail up either the Bush or the Wood river, much of the uncertainty that enveloped these western valleys might be cleared away, and perhaps, should we be fortunate enough to reach the base of either Mount Columbia or Mount Bryce, these giant peaks might be ascended more easily from the western than from the eastern side. Stutfield therefore wrote early in the year to T. E. Wilson, of Banff, who has always supplied us with men and horses, asking him to make inquiries about

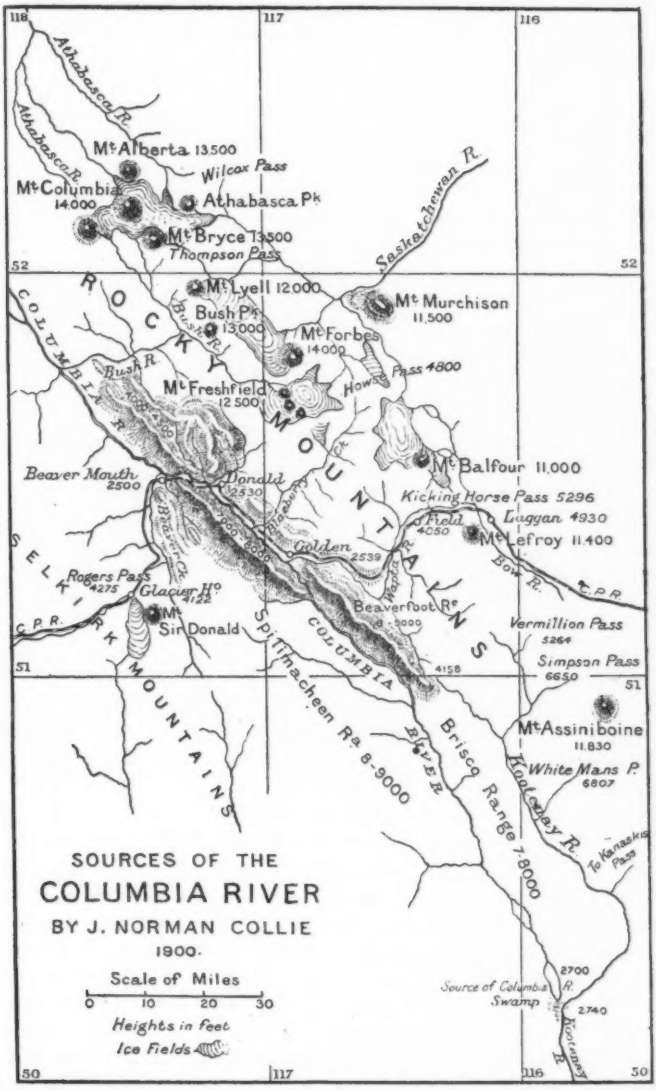
the Bush valley. Wilson therefore went over to Donald, where he met a trapper who eight years before had been up the Bush river as far as the foot of the main range. This trapper gave it as his opinion that the muskegs, the river, and the thick timber would make it extremely difficult, if not impossible, for horses. This seemed to be in the main probably true, for Hector had found great difficulty in forcing his way down one of these western valleys, the Blaeberry. Wilson also, many years ago, had been obliged to abandon all his horses in the same creek, only recovering them a week later by the help of several men, who returned with him and eventually cut them out of the thick timber.

In 1897 Baker and I also had entirely failed to make our way down this creek, and finally only escaped by traversing a new and high pass to Field on the south. When, therefore, Stutfield asked me last summer to join him in his expedition up either the Bush river or the Wood river, I felt that we were attempting a much more difficult task than anything we had done before on the eastern side of the mountains. One thing, however, was certain—a good trail existed along the Columbia river as far as the Big Bend, and should we decide to turn up the Bush river, although it would no doubt be difficult, still the actual distance up the Bush river to the snow-fields on the divide could not be much over 25 miles. Our party consisted of H. E. M. Stutfield, S. Spencer, and myself, Fred Stephens as headman, C. Black, H. Lang, and A. McAlpine.

On July 29 we started from Donald along the Columbia trail. The Waitabit and Bluewater creeks were soon passed, but the fact that the volume of water in them was small and did not contain glacial *débris* obviously meant that no great area of mountain country was drained by them; also that either they came from lakes, or had their rise in the small foothills where no glaciers existed. Our trail from Donald to the Bush river lay through dense forest nearly all the way; nowhere could an extended view be obtained, and the Columbia river was left far off to our left. For just below Donald the river makes an abrupt turn to the westward through a canyon, made, no doubt, long ago by the water finding a weak spot in a low range of hills which lies nearly parallel with the valley of the Columbia. The trail led us along the eastern side of this low range, and, as it ultimately happened, we never saw the Columbia again till we returned to Donald.

The vast forest through which we travelled far surpassed in size anything that we had seen on the other side of the range, huge pines, cotton-wood trees, and firs reaching to a height of 150 feet or more. The undergrowth was very dense; cedar, white maple, and alder (near the streams) abound, whilst the fallen trunks of dead trees, sometimes 6 or 8 feet through, lay scattered with others of lesser size in every kind of position. Some in their fall had been arrested by

others, and were waiting for the first gale to bring them crashing to the ground; whilst at the will of every breeze that wandered through



the upper branches of the higher trees, these half-fallen monarchs of the forest would break the heavy stillness of the air by their complaints

and groans against their more sturdy brethren for thus preventing them lying at peace upon the moss-covered ground below. Others that had lain for perhaps scores of years in the wet underbush had decayed and rotted, leaving rich masses of decomposing vegetation, from which smaller trees had sprung that in their turn also must fall and suffer the same change. There is a marvellous fascination about these immense quiet and shady fastnesses of the western valleys. As one wanders day after day through this underworld, cut off from the glaring sun of noonday and the blue sky, hardly a sound breaks the stillness, whilst all around the ruin of ancient woods lies piled with a lavishness most absolute—that of Nature's self, the tangled wreck of a lifetime, the luxuriant growth of centuries.

Here it was that we first made the acquaintance of that pest of British Columbian forests—the devil's club, a plant with large and broad leaves and a stem covered with spikes. Amongst the moist undergrowth this plant grows to a height of 5 or 6 feet, trailing its stems in every direction, and emitting a dank, unwholesome smell. These spikes, when they enter the flesh, break off, producing poisoned wounds which fester, and whilst cutting trail it is impossible to prevent the long twisted roots flying up occasionally, leaving their poisonous thorns in all parts of one's body. After crossing the Blue-water we followed a smaller creek, the Blackwater, in an almost northerly direction. This latter rises in some lakes, one of which at least is full of rainbow trout averaging about three-quarters of a pound. The highest of these lakes, which is situated on what might be termed a low pass, is about 800 feet higher than Donald, and from that point to where the Bush river is reached the trail descends. These lakes must be situated 5 or 6 miles from the Columbia river.

On August 3 we reached the Bush river, a deep, sluggish, and muddy stream, about 200 yards wide, and running between steep banks that obviously earlier in the year had been overflowed. It must be deep, for even at the bank there is 8 feet of water. The thick forest comes down to its very edge, and the floods that earlier in the year were produced by the melting snows had deposited for some considerable distance away from the stream a white sticky mud amongst the roots of the trees; swamps, too, were of frequent occurrence, and the thickets of willows, alders, and other small trees, together with much fallen timber of a larger size, made all hope of getting the horses through such a forest seem absolutely impossible. We found three boats moored at this crossing, two on one side and one on the other, with what appeared to us very insecure fastening—merely an old rope attached to a small stake driven into the mud on the top of the bank. These boats are for the use of travellers who are journeying to the Great Bend, and had been brought down the Columbia from Beaver creek. Stephens crossed over in one to the opposite side, to find out whether any trail

existed up the Bush river on the northern bank; but as only thick woods and swamps were discovered, he returned.

The weather now was very hot and sultry, and we camped near the Bush river by a small lake. That evening and night swarms of the most voracious mosquitoes I have ever come across nearly drove us distracted; as it was quite impossible for us to protect ourselves, early next morning a rapid retreat was made 5 miles back along our trail, to a spot less inhabited by this maddening scourge.

A mountain spur, forest covered, now divided us from the upper part of the Bush river. Over this we hoped to find a way. During the whole of next day Stephens and Lang were engaged in cutting

FOREST SCENE, BRITISH COLUMBIA.

about a mile of trail through the woods to the bottom of the steep ascent of about 1000 feet that led to the top. It would have been folly to attempt to take heavily laden ponies up this hillside; so, to get over the difficulty, the whole of next day was spent in completing the trail to the summit, and at the same time transporting half our baggage to the top, where it was left. From the summit of the ridge, which I have called Mount Pisgah, we got our first view of the snow mountains and of the valley through which we should have to wander for probably many days before arriving at the promised land. The country that lay stretched out before us at our feet made us feel very undecided whether to be pleased or otherwise. Certainly there were no narrow canyons

or defiles that would require lengthy *détours* up precipitous hillsides, and the valley was long, flat, and open; but we could see muskegs, streams, and shingle flats all tangled together, looking like a skein of ravelled grey wool thrown down between the dull green hills; whilst the main river, winding first towards one hillside, then towards the other, sometimes branching, again reuniting, formed a veritable puzzle of interlacing channels, islands of pebbles, stretches of swamps and small lakes, all hopelessly intermingled. At another place the water would spread itself far and wide over the flat floor of this desolate valley, and we wondered how long it would be before we could win to the foot of a splendid snow-peak that stood boldly up alone and solitary some 12 or 15 miles away. We hoped that this mountain was Mount Bryce, but, as it turned out later, we were destined to be disappointed.

Next day we loaded all the horses early with the remainder of the baggage. As there was no water on this mountain, at least anywhere near where we should be, it was absolutely necessary to get down on the other side the same day. This we eventually did, but only after nearly twelve hours' fighting with the forest. During our descent to the Bush river, one of our horses stampeded from the trail for about fifty or a hundred yards; but we could not stop to extricate him from the maze of fallen timber, even although he was laden with bacon, and it was not until next day that Stephens rescued him by the help of an axe, no doubt very thirsty and hungry. By barometer we were now just about the same height as Donald—2500 feet. During the night the barometer fell two-tenths of an inch, and next day we were treated to the kind of weather that more or less lasted till the end of our trip—rain, dull grey sky, and lowering clouds over all the mountains. As a matter of fact, we afterwards discovered that last August was the most unsettled and the wettest that had been experienced in the Canadian Rockies for many years.

On the 10th the provisions that had been cached on the mountain were brought down by Stephens, whilst I got my first experience of a kind of work that later was often to be reserved for me, namely, trail-cutting. To any one unaccustomed to using a heavy Canadian axe in a thick forest, it is decidedly hard work. Not only is one ignorant of how to cut through the fallen pines in the most expeditious way, but one is using a set of muscles rarely employed by the average man who follows a professional life in a large town. I should strongly advise any one visiting these western woods of Canada to take a light axe that can be used with one hand; for the brushwood it would be invaluable.

The next day, Saturday the 11th, saw us start along the southern bank of the Bush river. Hemmed in by the river against the hillside and the occasional muskegs, progress was very slow, and at last Stephens

thought we might try to ford the main stream, which at this point was about 200 yards wide. Here our troubles began. No sooner was Stephens about halfway across, than half a dozen of our baggage animals followed him. This, of course, should have been prevented, for, as it turned out, under the opposite bank the river was both deeper and stronger. There Stephens narrowly escaped drowning, when his horse, during a violent effort to climb the opposite bank, finally fell over on to him in the deep water. Lang also had managed to cross; but we, wishing neither to get wet to the skin nor to be swept down-stream, waited where we were. Finally, after unloading the horses, Stephens built a very shaky kind of raft, on which he and Lang

BUSH RIVER AND RAFT.

attempted to return. The main current, however, soon caught them, and they were swept rapidly past us down-stream. Just below this, Lang, probably in an attempt to pole the raft in water which must have been at least 10 feet deep, lost his balance and fell overboard into the icy water, his heavy boots dragging him down, and but for the presence of mind of Stephens, who crawled along the raft with a pole just long enough to reach Lang, there is little doubt that in a few moments he would have been drowned. There is no difficulty in launching a raft into the centre of a swift-flowing river, but to reach land again is a very different thing, and if it had not been possible to throw a rope to these two as they drifted rapidly round a sharp bend in

the stream about a quarter of a mile below, perhaps they might have sailed in a very short time to the unknown lower reaches of the Bush river. That night we camped on wet mud all together in one tent (the other was across the river), glad, however, that nothing worse had happened. Next day, undaunted by his experience, Stephens started to build another raft on a more magnificent scale, whilst I cut trail along the steep hillside that came down to the river's bank. This time success crowned Stephens' efforts, for by himself he got across, drove the horses back unloaded through the stream, and finally arrived safely with all our precious baggage on the raft.

On the morrow, some 3 miles further up the valley, we nearly lost all our meat. This was whilst we were edging along a narrow piece of very muddy land between the swamps and the river. Two mares deliberately walked straight off the bank into the main stream, which was at that point over 10 feet deep, and running strongly. One of them had 250 lbs. of bacon on her, consequently she went straight out of sight, but came up again for a moment some 20 yards lower down, only to disappear again. Fortunately, her next appearance was close against the bank, when two of the men promptly seized her. The other mare had also been washed against the bank, but, being unloaded, was easily hauled out; the other, however, with the bacon was underneath a mass of willows, and all we could do for some time was to keep her head above water, as she could not touch bottom. Eventually, by the help of a rope taken from one of the packs and seven men pulling, she was landed on her side on the bank, half-strangled; but our meat was safe. Again that night we had to camp in a swamp.

The days that followed were all spent in much the same fashion as the preceding ones. The river kept us prisoners on the south bank till the afternoon of the 16th, when we crossed at a place where it is spread out over a wide area of shingle flats, and camped at a point just opposite a shoulder of the high peak we thought was Mount Byrce, also just short of where the river forks. In ten days we had only made about 10 or 12 miles at the most as the crow flies, and in height had risen about 300 to 400 feet. Down the valley the main river winds backwards and forwards across the valley with innumerable side channels. The banks are covered often with a dense growth of willows, behind which are swamps and small lakes, fed often, no doubt, by the main river when in flood. Beyond these swamps rise the valley-sides, clothed in the densest forest. Our way was alternately through all of these, sometimes climbing and log-hopping up the hillside, cutting through the accumulated fallen rubbish of years, sometimes splashing and plunging through the swamps, sometimes fording side streams, sometimes squeezing our way through dense thickets of willow; all were tried, and we were entirely unable to say which was worst. Stephens was of the opinion that the north side, if we could have reached it, would afford much

better going; perhaps it might, certainly it could not be much worse than the south side.

The Bush river flowed from our camp in a westerly direction, but about half a mile up-stream the main valley was blocked by mountains, two valleys joining at this point, both being nearly at right angles to the valley we had been in for the last ten days. We were under the impression that the high peak that had been in front of us all the way up the Bush river was Mount Bryce, and therefore expected to find the

THE HAUNT OF THE WILD GOAT.

Columbia ice-field not many miles away round the corner to the north. Next day it rained steadily, and we did nothing; but on the morrow, as it cleared somewhat in the afternoon, leaving the horses, we climbed about 2000 feet up the mountain spur that lay between us and the north fork of the Bush river.

The mists lay low on the snow-peaks, but we saw that about 2 miles up the north fork a valley came in from the east, and glaciers lay at its head some 5 or 6 miles distant. The north fork itself stretched

away for miles, filled with dense pine woods; occasionally small shingle flats could be seen, and under the dull grey sky presented a dreary and inhospitable appearance. But Stephens talked of shooting cariboo, goat, and perhaps, if we were very fortunate, some big horn sheep. Black, however, gave it as his opinion that it was a country forsaken both by gods and animals, much to be condemned, and no fit place for a white man. Still, the appearance of the valleys puzzled me; it was somehow very different from what I had expected.

On the morrow Stephens went out to investigate the north fork, whilst Stutfield and I crossed the river, and after several hours of log-jumping of a most tiring description, we reached the south fork a little above where it joins the other stream. At this point the stream runs through a deep chasm cut out of the rock 200 feet deep. Here our exploration stopped, for we could not cross the river; so, finding the whole hillside covered with blaeberries the size of small grapes and of exquisite flavour, we had our lunch, and then returned to camp. One thing only had we discovered: far away up the north fork, how many miles we were unable to tell, we had seen Mount Columbia a beautiful pyramid of snow surrounded by great glaciers. Fred Stephens and Lang had been 4 or 5 miles up the north fork, passing a small shingle flat and the mouth of the valley that came in from the east. They reported that the fallen timber was dreadful, and that trail-cutting would be necessary every step of the way; moreover, that along the west bank gullies and steep hillsides with occasional small precipices seemed to entirely prevent us getting the horses along, unless we could cross the stream to the eastern side. By this time we were beginning to get anxious, for we had been out twenty-two days, which left us only a fortnight more. Something must be done, and quickly. Next day, therefore, August 20, Stutfield, Spencer, and I decided to climb to the top of the peak that lay in the angle between the north fork and valley up which we had come. As it turned out, it was both the finest and the most fortunate day of our trip. All the mountains of the main range were free from clouds, and we had a superb view from the summit of the peak when we got there. During the whole of the remaining fortnight that we were in the mountains the clouds never entirely lifted from the high peaks, and had we missed the view that we got on that afternoon, much of the knowledge of the geography of the district would never have been acquired.

The climb of about 5000 feet was very fatiguing; we had to fight almost every inch of our way through thick scrub or fallen timber. Just as I arrived within 100 feet of the summit, and was coming round a corner, I almost ran into an old he-goat; he was less than 100 yards away. After he had looked at me for some time, he went on eating, so I photographed him. Certainly he could have never seen a human being before.

Once on the summit, I at once recognized why the head of the valley had seemed different from what I had expected. Ten miles or more to the northward, up the north fork, was Mount Bryce, and beyond that Columbia and the great snow-field, with even the Twins showing far away at the headwaters of the Athabasca. Almost due east was Mount Lyell; we were therefore 10 to 12 miles south of where we expected to be. The mountain we had been calling Bryce, at the head of the Bush valley, was another peak altogether, and one that I had marked as "high peak" on the 1899 map. To the left of this lay Mount Forbes in the distance, whilst far away at the head of the south fork, rising from a great snow-field and glaciers, were the Freshfield group.

CAMP SCENE.

This explained why the Waitabit and the Bluewater creeks contained no glacier water; for the Bush river, and the Bush river alone, drained the whole area, from Mount Freshfield on the south, the back of Mount Forbes, and the western side of the whole Lyell ice-field to the north of the Columbia ice-field, which, splitting into several large glaciers, poured down in magnificent cascades of ice to the green pine woods that filled the valley below. And another point of considerable interest was the very low altitude of the valleys. At our camp at the forks of the Bush valley, just under the high peak we have named the Bush peak, we were only 2800 feet above sea-level, and looking up the north fork to the foot of the glaciers under Mount Columbia, the valley seemed to

rise but little—certainly nothing near 1000 feet. This Bush valley is therefore by far the lowest of any valleys that lie directly under the highest peaks.

But with this discovery of where we were came the extremely unpleasant fact that the Columbia ice-field, which was our goal, lay nearly 15 miles away up a valley, every yard of which would have to be cut with an axe. If we had already taken ten days to do about 10 miles, probably we should take at least a fortnight to force our way to the head of the north fork. And with this reflection we returned to our camp in the valley, somewhat disheartened and sad, for our plans would have to be changed, and as far as we were concerned, the finest snow-peak in the Rockies, Mount Columbia, would not be climbed by us that year.

During the day Stephens and Lang had been cutting trail to the mouth of the north fork, and along this trail we started next day with the intention of going as far up the valley as possible. In a very short time we were forced down to the side of the river, over which we could not pass in the state of flood in which it was in. We might have spent the remainder of the day cutting through another half-mile or so of fallen timber, but we were all heartily sick of the work; so, turning our horses' heads straight up the hill, after a long day, we found ourselves at timber-line, and about 700 feet below the top of the mountain we had been up the day before. Stephens had some idea of working along the hillside high up near the limit of the trees; but, as it turned out, we could not possibly have taken the horses further, for great ribs of rock seamed the hillside further on, entirely barring the way.

We were now at a height of about 7300 feet, and out of the wet valley below—no mosquitoes or flies, and a magnificent view in almost every direction; so, next day being moderately fine, we again ascended to the top of the peak above the camp, photographed, surveyed, and mapped as much of the country as possible. Stutfield spent the morning looking for the goat, but without any result. But in the afternoon he successfully stalked some across a small valley to the west, and shot one of them. That evening it began to rain; it continued all the next day and night and the following day, finally, on the third night, turning into snow. On the morning of the 25th it stopped, but it was impossible to do anything, as the whole hillside was one sodden mass of melting snow. The magnificent effects of great masses of clouds rolling about in the Bush valley below, with an occasional gleam of sunshine, gave us hopes of better weather; but the clouds never cleared away from the high mountains, and on the 26th an attempt to climb a big peak that lay behind our camp was carried out in dense mist. The weather seemed going from bad to worse. Reluctantly we retraced our steps on the 27th back to the camp at the foot of the hill, where we had cached about half of our provisions.

Whilst we were at the high camp, I had noticed that on the south side of the Bush valley, at the head of a small creek, an obvious pass seemed to lead through the mountains straight to the head of the Blue-water creek and so to Donald, and I had hopes that perhaps we might find a short cut home by that route; also at the same time be able to investigate the mountains that lay between the Blaeberry creek and the Bush valley. On the 28th we started down the valley with the intention of making our way up this creek to the pass, but we were unable even to begin the ascent of the creek with the horses; the usual fallen timber lay piled even thicker than usual, and a canyon with precipitous sides would have forced us far up on to steep hillsides, where

THE BUSH PEAK.

horses would hardly have been capable of going. We camped on the banks of the stream, amongst some large timber.

The view down the Bush river to the foothills that shut off the valley from the greater valley of the Columbia was exceedingly fine. In the foreground water and shingle stretched in desolate fashion westward to where ridges of dark pine woods sloped down from dusky peaks above, sending out point after point to strengthen the forms of the middle distance; whilst beyond, far away across the Columbia, the Selkirk mountains raised their snow-peaks into a calm clear sky, a mysterious land unexplored and unknown. Through a rift in the clouds in the far west shone the setting sun, tinging the dull grey clouds overhead

and the stealthily flowing river below with its many-coloured fires. The great gnarled trunks of pine and fir, festooned with moss, fungi, and grey lichen, the dead and drooping branches, and the half-fallen decaying trunks propped up in dreary melancholy array, caught for a moment the sunset's ruddy glow, whilst the mysterious shadows of the dense forest behind darkened by contrast. A faint evening breeze softly moved the upper foliage, a couple of inquisitive chipmunks were chattering near at hand, and a small stream could be heard whispering amongst the thickets down by the bank of the main stream.

Such evenings compensate one for many a wet dreary day spent amongst the great mountains. Nature suddenly offers them to the traveller without any toil on his part. He has only to sit watching, surrounded by the dark forest, the stretch of waters, and the ever-changing glory of the sinking sun; then, unmindful of the worry of yesterday or the uncertainties of the morrow, amidst the great stillness he feels with absolute conviction one thing and one only—that it is a good thing to be alive and free. Civilized life no doubt teaches us much, but when one has once tasted the freedom of the wilds, a different kind of knowledge comes. The battling with storm, rain, cold, and sometimes hunger, and the doubt of what any day may bring forth, these at least teach that life, that mere existence, is beyond all price.

Next morning, August 29, we climbed a hill that lay about 4 miles back from the river and to the south. This was necessary in order to find out how the valleys ran, and how the peaks were situated in that part of the country west of the Freshfield range and south of the Bush river. It was one of the most tiring expeditions I have ever taken up a mountain. To start with, there was the usual fallen timber, rendered still worse by small undergrowth; then a steep hillside of several thousand feet, where we had to struggle hard for every foot gained. Pushed back by small bushes, stopped by huge logs, stifled by the hot moisture-laden air, we dragged ourselves up foot by foot till at last we shook ourselves free from the woods, and were able to easily finish the climb on firm rocks and in the open air. The main chain of the Rocky mountains was in cloud, but fortunately there were no high peaks to the south-east, south, and west, so I was able to complete my plane-table survey of that district. We then returned by a somewhat different route, hoping that it would be easier, but eventually found ourselves cut off from the camp by a large muskeg, the dangers of which, however, we disregarded, and, wading straight through it, got back to dinner.

Three days later saw us at Fish lake again, where we built a raft, and spent Sunday, September 2, catching and eating rainbow trout. On the following day we made great efforts to catch No. 2, the west-bound train, at Donald, so that we should reach the hotel at Glacier that evening. The west-bound train, "No. 2," finally arrived at about four o'clock in the morning.

Our trip was ended: of course one is never satisfied, and we should have liked to have done more. We had, however, found out nearly all we wanted to know about the geography of the district.

Practically, the whole district between the Wood river and the Blaeberry creek is drained by the Bush river; the Waitabit and Blue Water creeks merely take the water from the foothills. A large glacier exists at the back of the Freshfield group; this is the source of the south fork, whilst the Lyell and Columbia glaciers feed the north fork of the Bush river. Another system of glaciers that lie to the west of Mount Bryce feed two tributaries of the Bush river that flow southward and parallel with the north fork. The magnificent snow-capped peak, about 13,000 feet high, standing almost over the junction

THE SPENCER RANGE.

of the north and south forks is not Mount Byrce, as we had supposed, but is a new unnamed mountain. I think that, as it can be seen all the way up the Bush valley, it ought to be named the Bush peak. The great depth of the Bush valley is also of interest, and the fact that, to start with, both from Mount Freshfield and Mount Columbia, the valleys lie parallel with the main chain shows that probably the same forces that fashioned the valleys on the eastern side also made those on the west. This pressure, in many places at the headwaters of the Bush river, had contorted the rock into the most fantastic bends and loops. The strata sometimes would be perpendicular, and again within a few hundred yards twisted into S-shaped figures and crumpled forms. This contortion seemed general, and far more pronounced than anything that I have seen on the eastern side of the mountains. The general lie of the country was a series of more or less tilted strata facing north-east, with gentle slopes towards the south-west and precipitous faces towards the north-east, the ranges consisting chiefly of Carboniferous and Devonian limestones.

Prof. Bonney, F.R.S., has kindly examined one or two rocks that were brought home. In the bed of the Bush river there was a considerable amount of limestone with fossil corals in it. Prof. Bonney

describes it as follows: "It appears to belong to the genus Lithostrotion, and one at least is very like the Martini of Britain. This belongs to the Carboniferous limestone age." Another limestone: "Contains numerous fragments of organisms, but ill preserved, some, perhaps foraminiferæ, are like an ostreod, others probably mollusca." A third limestone: "The ground mass appears to retain traces of organisms and show signs of pressure. The round spots are puzzling; the mode of occurrence suggests oolitic grains, but they have a coarse granular structure—perhaps recrystallization has taken place."

There seems to be only one pass below timber-line connecting the Bush valley with the east side of the range. This I had seen when on the summit of Mount Athabasca. My friend Charles S. Thompson, of Chicago, explored the pass this summer by way of the west branch of the north fork of the Saskatchewan. As he is the first person who has been on its summit, I have called the pass Thompson pass. It is 6800 feet above sea-level, and below timber-line.

The question of passes and sources of rivers amongst the Canadian Rocky mountains is a most interesting one. On the Athabasca pass, a small tarn called the Committee's Punch Bowl drains both ways. Ross Cox gives an accurate description of it in the 'Fur Hunters of the Far West.' He says, "We reached what is called the great height of land. At this place a small circular basin of water 20 yards in diameter, dignified with the name of a lake, out of which flow two small creeks; the one discharges itself into Portage (*i.e.* Wood) river, that on the east joins the Athabasca. Prof. Coleman gives a similar description. Just south-east of the Athabasca pass lies Fortress lake, discovered by Prof. Coleman. This lake is about 8 miles long, and here the same thing happens. "The lake has a curious subterranean outlet in a tributary of the Chaba river, but sends most of its waters into the Wood river." *

Probably, if there were a lake on the summit of the Blaeberry, a similar state of affairs would be found, for the summit is quite flat, Dr. Hector's description being as follows: "The summit is wide and spacious, a few swampy streams flowing east, a little further on a small creek issuing from a number of springs flowing westward." When going west by the railway from Donald to Glacier House through the canyon that the Columbia has cut between Donald and Beaver Mouth, it seemed to me possible that centuries ago there had been a large lake filling the Columbia valley to the south from Donald to the upper lakes. This lake would again be reproduced if the canyon between Donald and Beaver Mouth were filled up for a height of less than 200 feet. Donald is 2530 feet, whilst the upper Columbia lake is 2700 feet. The south end of the upper Columbia lake is only cut off by about 2 miles of swamp from the Kootenay river. All along the

* Prof. A. P. Coleman, *Geographical Journal*, January, 1895, p. 58.

wide Columbia valley from Donald to the lakes are well-marked terraces of white calcareous mud, whilst at the bottom of the valley are a chain of great swamps. If the whole of this valley had at any time been a large lake, chiefly or wholly draining to the south,* it is quite likely that the Kootenay river, as it breaks into the wide valley just below the Columbia lakes from the north-east through a rocky gorge, would gradually have silted up the south end of the lake, so raising the height till at last a weak spot was found at the north end, and the whole drained away down the present valley of the Columbia. Moreover, if one looks at the direction in which the Spilimichene and the Shuswap creeks flow, it looks as if they at least were flowing into a river whose course was south, and not north. Now, if in former times this great lake had drained south, then the old headwaters of the Columbia were in the Bush river, and its source was amongst the great glaciers that sweep down from Mount Columbia and the Columbia ice-fields. Surely, for the birthplace of one of the most magnificent rivers of the West such a spot is more fitting than a swamp amongst the foothills! Surely its source should be where the huge snow-clad peaks rise high into the clouds, where the avalanche thunders, where the dark precipices keep guard over the valleys beneath, and where the Rocky mountains culminate in one great effort; for there, amidst ice and snow in the glacier caves, is born the Athabasca, that old river of the lonely northland; and there arise the rivulets that later become the mighty Saskatchewan!

Before the reading of the paper, Sir THOMAS HOLDICH, Vice-President, in the chair, said: Prof. Norman Collie is no stranger to you. It is not so very long ago that he told us of his adventures in 1897–98, and now he will again take us into the untravelled paths of the Rockies, north of the Canadian Pacific railway, and I am sure will give us a most interesting paper about that country.

After the reading of the paper, the following discussion took place:—

Sir THOMAS HOLDICH: *Apropos* of this interesting paper, a letter has been received from Mr. Whymper, the well-known mountaineer and explorer of American mountains, which, with your permission, I will read to you.

"I regret that I cannot be present at the reading of Dr. Collie's paper on the 14th inst. I have just returned from a run over the Canadian Pacific railway, and have twice passed within sight of the slopes where his journey commenced, and saw a fair sample of the forest through which he had to make his way.

"The whole continent was under snow, from 6 inches to 3 feet deep, and this rendered the extraordinarily intricate interlacement of the fallen trunks more apparent than it is in the summer-time. It was obvious that no beasts of burden could be led or driven through such a tangled mass of timber without a way being prepared for them, and it appeared to me that progress might easily be reduced to a mile per day. The ranges, which are traversed from east to west by the Canadian

---

* Compare G. M. Dawson, "Preliminary Report on the Physical and Geological Features of that Portion of the Rocky Mountains between lats. 49° and 51° 30′," Part B, 'Annual Report,' 1885, pp. 28–32.

Pacific railway, are more than twice the length of Switzerland, and throughout the greater part of this distance the lower slopes of the mountains are covered with dead forest, which must be penetrated somehow by any one who aspires to higher ground. The difficulties commence sometimes within a few hundred feet of the line. The managers of the railway are well aware that paths are wanted. Already a good many have been made, or trails have been cut in the vicinity of some of the most attractive points on the line, and many more are contemplated.

"Anything that Dr. Collie can say respecting the temperatures he experienced at the highest points he has gained in the Canadian Rockies will be welcome, for there are very few recorded observations. It is generally said, and it seems to be the fact, that *in the winter*, in the Canadian Rockies, at the height of 5000 feet above the sea, temperature is higher than it is upon the prairies, more than 3000 feet lower down. Anyhow, in the principal street of Moose Jaw (1725 feet), I saw on November 21 last, at 11 a.m., a large thermometer on the sunny side of the street *with the sun shining on its bulb*, and the spirit standing at 5° Fahr.; while on the following day, at the same hour, when more than 3000 feet higher, temperature was only a few degrees below freezing-point. This inversion of the usual order of things is not uncommon in other parts of the world *in winter*, but does it also occur in the summer?"

That is a question I shall leave to Prof. Norman Collie.

Mr. STUTFIELD: You will gather, from Prof. Norman Collie's paper, that travel on the western side of the Rockies, especially in the Bush river, is not altogether an unmixed joy; you will also gather that we were not so successful as we had hoped to be, owing to the weather and also to a circumstance which he omitted to mention, the worst bit of luck that befell us. By an unfortunate accident at the beginning of the expedition, a horse falling back, we lost our best axeman. Owing to this accident, we spent four or five extra days going up the valley. As Dr. Collie told you, I am largely responsible for having brought him to the Bush river. After our trip in '98 I made inquiries, and we thought the route seemed feasible. I am responsible for taking the west side of the mountains, but I am not responsible for the weather and for the maps being entirely wrong. As, however, Dr. Collie was afforded the opportunity of putting the maps right, our trouble was not entirely wasted. You have heard what made the journey so difficult. Timber we anticipated, but the tremendous amount of tangled undergrowth was entirely different from that on the eastern side of the Rockies; logs piled on logs, the very soil seemed composed of rotting tree-trunks and decaying vegetable matter, and if the bottom of the valley was wide, the swamps on each side gave forth a reeking mist every morning which chilled one to the bone; but worst of all were the mosquitoes. It was even a pleasure to reach our high camp, where we lived for seven days in fog and snow and slush, and only once saw the mountain-tops. The sun was going down, the clouds drifted together, and we had the finest scenic effect I have ever seen in the mountains—peak after peak opened out, lit up by the pale saffron glow; in fact, all our hardships were counterbalanced by the beauty of that scenery. To see the Rocky mountains properly, you must climb some peak, whence you will see a wilderness of mountains. You cannot, of course, see a tenth or a hundredth part of them, but in imagination you can see them stretching away hundreds of miles to the north and south and westwards to the Pacific. I don't think there is any other country in the world with the same wonderful panorama of mountains. Having regard to the beauties of the country, I think it ought to be better known than it is, and two years ago I prophesied that in the course of some years' time the Canadian Rockies would be the playground of America, as Switzerland is for Europe. A good deal has been done towards the fulfilment of

this prophecy. The Canadian Pacific railway have placed guides in various places, and soon we shall hear of mountains hitherto deemed inaccessible being regarded as easy trips for a lady. Two days ago I received a copy of a local journal with an account of our journey written by our cook, and I notice the rival organ sneered at the mention of scenery. It seems out West they have little appreciation of natural beauties, and, in spite of the general cuteness of the American mind, they have yet to learn the commercial value of scenery. In the Rockies they must live on scenery for some time to come. After all, the Swiss have been living on it for a long time, and they have grown pretty fat. Very few minerals of any value have been found so far. The chief wealth of the country lies in its scenery, and I feel quite confident that our playground is destined to afford recreation and profit for many thousands in the not far distant future.

Mr. G. P. Baker: I feel that you will all agree that there must be an extraordinary fascination in mountain exploration to entice such men as Prof. Collie, with a comparatively limited holiday at their disposal, to travel from 5000 to 6000 miles to reach the region of these Rockies, which he has so well described and so beautifully illustrated. Some of you would, perhaps, hardly think the game worth the candle; but, as one of his early companions, I may say I was perfectly satisfied, speaking from the mountaineer's point of view. Collie has done very much to open up the country on the eastern slopes of the range. Two years ago Mr. Stutfield prophesied that the north fork of the Saskatchewan would be joined by paths—that, in fact, it would be the Zermatt of the country. Everything tends to this end, and already the Canadian Pacific railway authorities have cut a pony-path to the Bow lake. Last year the railway authorities had introduced seven Swiss guides. They take them over in May, returning them in October and during the summer months. I understand they have guided some 1700 tourists among the mountains and glaciers. I quite agree with Mr. Stutfield that the time is not far distant when these Alps will become the playground of the American continent.

Prof. Norman Collie: I have to thank you for the very kind way in which you have listened to me. With regard to the temperature of the Canadian Rocky Mountains, I don't think the temperature in August is different from that in any other mountainous land at the same latitude; the days are warm, and occasionally the nights are cold, exactly as one expects it to be. I should like, also, to thank the Geographical Society for having kindly lent me a Watkins barometer to take with me to the mountains. I must say I found it useful; it was very light and easily carried, and if it were always correct it would be perfect, but the one I had certainly went wrong, and I should not have discovered this had I not had a mercurial barometer with me. It went as much as $\frac{3}{10}$ inch out. On arrival home I left it in my laboratory for a month, and it finally went $\frac{1}{2}$ inch out. I then brought it back here, when it was returned to the makers, who put it right, but after a month it went $\frac{1}{2}$ an inch out again; it was then left to itself, and proceeded to get right again. Now, such an instrument must be carefully watched. I should be pleased to take it out again, but I should like to have a mercurial one to check it with.

There is one thing more I should like to say. Since the paper I have just read was printed, I have found that my suggestion, that the present source of the Columbia river is not the original source, is not novel. In the Annual Report (Part B, 1885) of the Geological and Natural History Survey of Canada, Dr. Dawson has already drawn attention to "the present condition of the valley of the Columbia in regard to its drainage being both peculiar and anomalous." He also refers to "the Columbia-Kootenay valley as an orographic feature

of the first importance;" then he points out that undoubtedly at one period the present Columbia valley, from the upper Columbia lake to the mouth of the Kicking Horse, drained southwards; saying that, "regarded as a whole, the valley is widest in its southern part, and this constitutes one argument in favour of its original southern outflow." In his description of the detrital deposits which now fill up the floor of the valley, he writes, "In a number of places, collections of irregular mounds and ridges occur, which are certainly morainic in character. . . . These, with frequent intercalations of sand and gravel, are largely composed of fine pale silts. . . . It would thus appear that the origin of the Columbia-Kootenay depression must be sought at a remote period of great or very long-continued erosion subsequent to the era of mountain elevation at the close of the Laramie, and the facts are in favour of the belief that the river producing it flowed to the southward. . . . In later Tertiary times, and during the Glacial period, a portion of the ice accumulating on the adjacent ranges discharged southward by this valley. On the withdrawal of this great glacier, morainic accumulations were formed along its retreating edge, and by smaller glaciers at the mouths of the lateral valleys. At this time, or not long thereafter, owing to some combination of circumstances, . . . the valley was flooded to a considerable depth, and the white silt deposits—the material of which was directly due to the action of glaciers still existing in the neighbouring mountains—were laid down." Even after this period, Dr. Dawson is of the opinion that the valley drained to the south. Later, however, he says, "the great quantities of coarse detritus brought in by the lateral streams would have a tendency, by interrupting this flow at various points, to produce a series of long lakes. The actual exceptionally slight slope of the portion of the valley occupied by the Columbia, however, with the fact that the flow is now northward instead of to the south, favour the belief that a change in level occurred, by which the northern part of the district was relatively lowered, and that this, in conjunction with the great deposit formed by the Kootenay at the place at which it enters the valley, determined the present position of the water-shed between the two streams, and reversed the direction of flow in that part of the valley now occupied by the Columbia."

Sir Thomas Holdich: Since the days when Pallisser and Hector first unfolded to us the majesty of the Rocky mountain scenery, we have had many travellers in that direction, notably Coleman, who first displaced Mounts Brown and Hooker from the position they held for so many years as the highest mountains in Northern Canada. Subsequently we had Green and Wilcox, who introduced us to mountain scenery south of that line, and the Government surveys of part of the country. But the Government cannot deal with more of the country than promises well for economical development, so there still remains a vast area of playground for future enterprising travellers. The reasons why this land has been slow in the opening process have been indicated to us to-night by Prof. Norman Collie. I take it that the "devil's scrub" is one of them and the mosquitoes another, although it seems that the mosquitoes happily proved to be of a non-malarious order. Now I must ask you to join me in offering a cordial vote of thanks to Prof. Norman Collie, and to congratulate him on the exceeding beauty of his illustrations.

A BATHYMETRICAL SURVEY OF THE FRESH-WATER LOCHS OF SCOTLAND.*

By Sir JOHN MURRAY, K.C.B., D.Sc., F.R.S., and the late FRED. P. PULLAR, F.R.G.S., F.R.S.E.

Part II.—The Remaining Lochs of the Forth Basin.

Introduction.

Part I. of this work, dealing with the lochs of the Trossachs and Callander district, viz. Lochs Katrine, Arklet, Achray, Vennachar, Drunkie, Lubnaig, Voil, and Doine, was published in this Journal in April, 1900. This second part treats of the remaining lochs of the drainage basin of the Forth, viz. Loch Chon, with Lochan Dubh, Loch Ard, and Lake of Menteith in Perthshire, and Loch Leven in Kinross-shire. The methods and apparatus used were the same as those described in Part I., all the soundings having been taken from rowing-boats with the F. P. Pullar sounding-machine.

Maps and Illustrations.

The general map of the district published in Part I. includes the lochs now treated of, except Loch Leven. The four maps illustrating this part show the depths in each of the lochs under consideration, on the scale of 3 inches to the mile (1 : 21,120), most of the soundings taken during the survey being given in feet. The intervals between the contour-lines of depth are indicated by different shades of blue, and the intervals between the contour-lines of height of the neighbouring country by shades of brown.

Plate I. shows Loch Chon with Lochan Dubh, the contour-lines of depth being drawn in at 25, 50, and 75 feet.

Plate II. shows Loch Ard, the contour-lines of depth being drawn in at 25, 50, 75, and 100 feet.

Plate III. shows Lake of Menteith, the contour-lines of depth being drawn in at 10, 25, 50, and 75 feet.

Plate IV. shows Loch Leven, the contour-lines of depth being drawn in at 10, 20, 50, 70, and 80 feet.

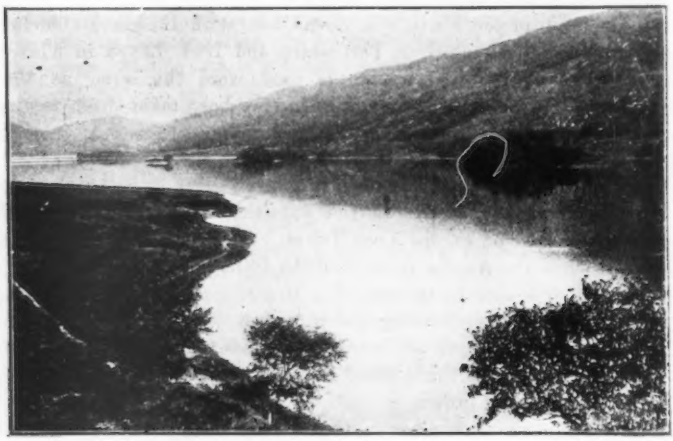
In addition to the maps, there are four woodcuts in the text, illustrating the character of the scenery around the lochs.

Depths of the Lochs.

Loch Chon.—There are two lochs in Perthshire bearing this name, the one a little loch in the parish of Blair Atholl. The Loch Chon now under consideration lies to the south of Loch Katrine, and trends in a

* Continued from vol. xv. p. 352. Maps, p. 332.

north-west and south-east direction. It lies at a height of 296 feet above sea-level, and the river into which it flows expands, a little distance to the south-east, into a small loch, Lochan Dubh or Loch Dhu, the surface of which is 10 feet lower. Loch Chon is over $1\frac{2}{3}$ miles in length, and the greatest width is about one-third of a mile. The mean breadth, obtained by dividing the area of the loch by its length, is a quarter of a mile, being 15 per cent. of the length. Its waters cover an area of about 277 acres, or less than half a square mile, and it drains an area about $14\frac{1}{2}$ times greater, or nearly 4000 acres (nearly $6\frac{1}{4}$ square miles). The number of soundings taken in Loch Chon was 157, the greatest depth observed being 75 feet. The mass of water contained in the loch is estimated at 358,000,000 cubic feet, and the mean depth



LOCH CHON.

(*From a photo by G. W. Wilson.*)

at over 29 feet, or 39 per cent. of the maximum depth. The length of the loch is 120 times the maximum depth, and 305 times the mean depth.

Loch Chon is irregular in outline, and the contour-lines are also irregular. The deepest part of the loch (*i.e.* exceeding 50 feet) forms a long narrow depression, situated approximately in the centre of the loch, but closer to the western than to the eastern shore, about seven-twelfths of a mile in length, with a maximum width of over one-sixth of a mile. The maximum depth, 75 feet, was found comparatively very close to the western shore, being in fact only about 130 yards distant; this gives a slope of almost 1 in 5, and a similar steep slope is indicated by the near approach to the shore of the contour-lines for a considerable distance along the western side of the loch. The slope from the eastern shore is, generally speaking, more gradual. The 25-feet depression is

divided into two portions by the rising of the floor of the loch about a quarter of a mile from the southern end. The maximum depth in the smaller southern depression is 49 feet. The larger 25-feet depression, separated from the smaller one by an interval of about one-eighth of a mile, is over $1\frac{1}{4}$ miles in length, approaching close to the north-western end of the loch, with a maximum breadth of three-eighths of a mile. This larger depression is very irregular in outline, occupying nearly the full width of the loch towards the centre, while a short distance farther south there is a narrow constriction in the vicinity of the Heron islands.

The area of the bottom between the shore-line and the 25-feet contour is about 119 acres, or 43 per cent. of the total area of the loch; that between the 25- and 50-feet contours is about 127 acres, or 46 per cent.; and that deeper than 50 feet is about 32 acres, or 11 per cent.

Lochan Dubh.—This little basin is one-fifth of a mile in length, and less than one-sixth of a mile in maximum width. Its waters cover an area of about $11\frac{1}{2}$ acres, and it drains an area eighteen times greater, or about 205 acres. The mean breadth is less than one-tenth of a mile, or 45 per cent. of the length. Twenty-five soundings were taken in Lochan Dubh, the maximum depth observed being 41 feet. The cubic mass of water is estimated at 586,000 cubic feet, and the mean depth at nearly 21 feet, or 50 per cent. of the maximum depth. The length of the loch is 28 times the maximum depth, and 56 times the mean depth.

Lochan Dubh is very simple in construction, shoaling on all sides down to the deepest part. As in Loch Chon, the slope seems to be much steeper off the western than the eastern shore, a cast of 35 feet having been taken comparatively very close to the west side. The water shallows where the loch narrows a little above the outlet, a depth of $3\frac{1}{2}$ feet being found where the bottom is covered with reeds. The area of the bottom between the shore and the 25-feet contour-line is about 7 acres, or 60 per cent. of the area of the loch, and that deeper than 25 feet is nearly 5 acres, or 40 per cent.

Loch Ard.—Loch Ard receives the outflow from Lochan Dubh and Loch Chon; it trends in an east and west direction, sending out one prolongation to the south and another to the east. Its level is 105 feet above the sea. It is over 3 miles in extreme length, including the eastern prolongation, but the body of what may be called the loch proper is about $2\frac{1}{3}$ miles in length, from the head of the loch to Helen's Rock. The greatest width, measured from the extremity of the southern prolongation to the northern shore of the loch, is over 1 mile, the mean breadth being two-fifths of a mile. Its waters cover an area of over 600 acres (nearly 1 square mile), and it drains an area more than ten times greater, or about 6250 acres ($9\frac{3}{4}$ square miles). The number of soundings taken in Loch Ard was 308, the maximum depth being 107 feet. The cubic mass of water contained in the loch is estimated at

1,150,000,000 cubic feet, and the mean depth at nearly 44 feet, or 41 per cent. of the maximum depth. The length of the loch is 113 times the maximum depth, and 277 times the mean depth.

Loch Ard proper forms a comparatively simple basin, shoaling from the shores down to the deepest part. The 100-feet depression occupies a central position, and is about three-quarters of a mile in length. The 75-feet depression is over $1\frac{1}{4}$ miles in length, while the principal 50-feet depression, over $1\frac{1}{2}$ miles in length, is separated by a very short interval from a small detached area in the north-western part of the loch at Kinlochard, in which the depth exceeds 50 feet. The 25-feet contour-line is very irregular, and there are four isolated patches in which the

LOCH ARD, WITH BEN LOMOND IN THE DISTANCE.

(*From a photo by J. Valentine.*)

depth exceeds 25 feet: the largest one in the southern prolongation at Couligartan has a maximum depth of 39 feet; a second small area occurs between the southern prolongation and the island of Eilean Gorm, in which the maximum depth is 35 feet; the other two areas are situated in the eastern prolongation of the loch, the maximum depth in the eastmost depression near the outlet of the loch being 33 feet, and in the other 39 feet. The soundings taken between Duke Murdoch's Castle and Briedach show that the bottom is very irregular; the first sounding gave a depth of 17 feet, followed by 44 feet, then 38 feet, then 23 feet, then 31 feet, the bottom rising on approaching the elevation on which Briedach and a beacon are situated.

The area of the bottom between the shore and the 25-feet contour-line is about 240 acres, or 40 per cent. of the area of the loch; that

between the 25- and 50-feet contours is about 154 acres, or 25 per cent.; that between the 50- and 75-feet contours is nearly 64 acres, or 11 per cent.; that between the 75- and 100-feet contour-lines is about 78 acres, or 13 per cent.; and that deeper than 100 feet is nearly 65 acres, or 11 per cent.

Lake of Menteith.—The Lake of Menteith resembles Loch Leven somewhat in outline, and in being relatively a very shallow basin. It is also historically related with Loch Leven, since Queen Mary at one time lived within their precincts; the ruins of the Priory on Inchmahome, in which she resided before her removal to France, are of great architectural beauty and antiquarian interest. Its surface is only 55

LAKE OF MENTEITH.
(*From a photo by G. W. Wilson.*)

feet above the sea. Its maximum length is over 1½ miles, and the maximum width over 1 mile, the mean width being five-eighths of a mile. Its waters cover an area of 652 acres (over 1 square mile), and it drains an area 6¼ times greater, or over 4000 acres (nearly 6½ square miles). The number of soundings taken in the Lake of Menteith was 375, the maximum depth being 77 feet. The cubic mass of water contained in the loch is estimated at 562,000,000 cubic feet, and the mean depth at 19¾ feet, or 26 per cent. of the maximum depth. The length of the loch is 110 times the maximum depth, and 427 times the mean depth.

The bottom of the Lake of Menteith is apparently very irregular. The 10-feet line follows approximately the outline of the loch, except that it is considerably removed from the south and south-east shores,

where the land is bordered by reeds; it also surrounds the islands of Inchmahome, on which the Priory is situated, and Inch Talla, on which the castle is situated, Dog isle, and a submerged crannog covered by 4 feet of water in the north-eastern angle of the loch at Port of Menteith. The area of the bottom covered by more than 25 feet of water is cut up into three portions. The eastmost of these 25-feet depressions has a maximum depth of 48 feet; the central 25-feet depression is almost triangular in outline, with a maximum depth of 49 feet. The westmost 25-feet depression is the largest and deepest; it is almost divided into two halves by a narrow constriction between Inch Talla and Stable point, the deepest water observed in the southern half being 49 feet, while the northern half contains the deepest water found in the loch. Here the bottom falls below the depth of 50 feet over an area of nearly 32 acres, the 50-feet depression being about a third of a mile in length and over a sixth of a mile in maximum width. It encloses a small patch in which depths of 75, 76, and 77 feet were observed—the maximum depth of the lake—situated comparatively close to the northern shore at Coilledon.

The area of the bottom between the shore and the 10-feet line is about 22 acres, or 34 per cent. of the whole area of the loch; that between the 10- and 25-feet contours is about 255 acres, or 39 per cent.; that between the 25- and 50-feet contours is about 142 acres, or 22 per cent.; and that over 50 feet nearly 32 acres, or 5 per cent.

Loch Leven.—Loch Leven has long been famous for its trout. In the 'Old Statistical Account of Scotland'* we read: "The high flavour and bright red colour of the trout seem evidently to arise from the food which Nature has provided for them in the loch. What appears to contribute most to the redness and rich taste of the Loch Leven trout is the vast quantity of a small shellfish, red in its colour, which abounds all over the bottom of the loch, especially among the aquatic weeds. The trout when caught have often their stomachs full of them."

About the year 1770 the trout brought about a halfpenny each, large and small, and perch a halfpenny per dozen. Some years later the price was doubled, and towards the end of the century the trout were sold at 4*d.* per lb., pike 2*d.* per lb., and perch 2*d.* per dozen. In 1845 two boats and four boatmen were employed during part of the fishing season, while in 1891 there were twenty-two boats on the loch for the use of anglers. Extensive operations for the draining of the loch were completed about the year 1845 at a cost of £40,000, by which the loch was lowered 4½ feet, and the area reduced by about 1400 acres; some people maintain that the quality of the trout has been injuriously affected by the draining. Prior to 1856 rod fishing was disappointing, but about that time, from some cause that does not appear to have been

* Vol. vii. pp. 166, 168. 1793.

satisfactorily explained, the fish rose more freely to the bait, angling became more encouraging, and Loch Leven became a resort for anglers from all parts of the country. Some years ago the fishing was taken over by the Loch Leven Angling Association, Limited, who pay a rental of £1000 per annum. The statistics regarding the trout caught by rod in the loch, and their weight, show great fluctuations from season to season. In 1872 over 17,000 were taken, the average weight being nearly 1 lb.; in 1873 the take fell to 13,400, in 1874 to 6400, in 1875 to 5000, and in 1876 even less. In 1877 the take rose again to 6000, in 1878 to 13,000, and in 1879 to 21,000, but the average weight seems to have been less. The best year recorded during the last quarter of a century was in 1888, when 23,516 trout were taken weighing 21,074 lbs. In 1893, 1898, 1899, and 1900 the takes again exceeded 20,000, but the weight never equalled the 21,000 lbs. of 1888, the nearest approach being in 1893, when 23,100 trout weighing 19,500 lbs. were caught. Last year (1900) the trout taken by the rod numbered 23,811, weighing 15,584 lbs., an average of 0·654 lb.

Perch are also abundant, and pike are not uncommon. Formerly charr were frequently taken, but they appear to have become scarce in recent years. The American weed (*Elodea canadensis*) appears to have become firmly established in certain parts of the loch, and is causing a great deal of trouble, all the means hitherto tried for the purpose of destroying it being only of temporary benefit.

On St. Serf's island (which is about 80 acres in extent) are the remains of a priory dedicated to St. Serf, said to have been founded by a Pictish king, and given to the Culdees. The castle (on Castle island, which has an area of about 5 acres) is said to have been founded by Congal, son of Dongart, king of the Picts. It is famous in history as the prison in which the unfortunate Queen Mary was incarcerated for eleven months, and from which she effected her romantic escape.

Considering the area covered by the waters of Loch Leven, it is an extremely shallow loch, its mean depth being less than that of any other loch hitherto examined by us. When measured by the Ordnance Survey officers in August, 1893, its surface was found to be 349·6 feet above the level of the sea. In form it is somewhat pear-shaped, the greatest length being $3\frac{2}{3}$ miles from south-east to north-west, and the greatest width is about $2\frac{2}{3}$ miles. The mean width is nearly $1\frac{1}{2}$ miles, being 40 per cent. of the length. Its waters cover an area of nearly 3400 acres ($5\frac{1}{3}$ square miles), and it drains an area nearly ten times greater, or about 32,500 acres (nearly 51 square miles). The number of soundings taken in Loch Leven was 538, the maximum depth being 83 feet. The bulk of water contained in the loch is estimated at 2,195,000,000 cubic feet, and the mean depth at less than 15 feet, being 18 per cent. of the maximum depth. The length of the loch is 232 times the maximum depth, and 1296 times the mean depth.

An examination of the map shows how uneven the bottom of Loch Leven is. The deepest part of the loch is cut up into two portions, the larger depression lying to the west and south of St. Serf's Island, with a maximum depth of 83 feet—the greatest depth observed in the loch—the smaller depression being situated in the north-western part of the basin, and attaining a maximum depth of 79 feet. The larger 70-feet depression lies to the west of St. Serf, with two isolated soundings of 70 feet farther to the south-east; the smaller 70-feet depression is in the north-western part of the loch, with an isolated sounding of 71 feet. The larger 50-feet depression to the south and west of St. Serf is nearly a mile in length, while the smaller in the north-western portion of the basin is a little over half a mile in length. The larger 20-feet

LOCH LEVEN AND CASTLE.

(*From a photo by J. Valentine.*)

depression is very irregular in outline, extending from near the outlet of the loch at the river Leven along the southern and western shores of St. Serf, and sending a wide branch in a westerly direction and another in a north-westerly direction towards Castle Island, with an extreme length of about 2 miles. It is separated by an interval of about half a mile (in which the bottom rises in a pear-shaped elevation —a sunken island—covered by 5 to 9 feet of water) from the north-western 20-feet depression, which is apparently extremely regular in outline, being about two-thirds of a mile in length, and over one-third of a mile in maximum width. The 10-feet line follows approximately the contour of the loch, except off the eastern shore to the north of St. Serf, where the 10-feet line runs on an average nearly three-

quarters of a mile distant from the shore. The 10-feet line also surrounds Reed Bower, Castle Island, and Scart Island, and in addition to the elevation in the central part of the loch already mentioned, there is another small elevation covered by depths of 3 to 7 feet near the southern shore off Waterbutts Plantation.

The area of the bottom between the shore and the 10-feet contour-line is about 1430 acres, or 42 per cent. of the whole area of the loch; that between the 10- and 20-feet contours is nearly 1450 acres, or 43 per cent.; that between 20 and 50 feet is about 375 acres, or 11 per cent.; that between 50 and 70 feet is nearly 110 acres, or 3 per cent.; and that over 70 feet is about 25 acres, or 1 per cent. It will thus be seen that no less than 85 per cent. of the bottom is covered by less than 20 feet of water, and the mean depth, as already mentioned, is less than 15 feet.

[The details regarding the physical features of the different lochs are collected together in the table on p. 282 for convenience of reference.]

Deposits.

The general character and composition of the muds from the lochs under consideration do not differ from what was described in Part I. The mineral species are the same as there enumerated, and are nearly always angular. The muds contain no carbonate of lime; oxide of iron is present in them all, but appears to be in greater abundance in the Loch Chon samples.

Three brown muds were examined from Loch Chon, from depths of 10 feet, 14 feet, and 37 feet. The colour was lighter, and the mineral particles were more abundant and larger, in the shallower water. In the deposit from 10 feet the mineral particles made up probably 35 to 40 per cent., and included a few rock fragments which sometimes attained a diameter of 10 mm., the mean diameter of the mineral particles exceeding 0·05 mm. in diameter being about 0·3 mm., while in the deposit from 37 feet the percentage falls to about 10, with a mean diameter of 0·1 mm. Inversely, clayey matter and vegetable matter were more abundant in the deeper water, mixed with minute mineral particles, impregnated with ferric oxide, and containing diatoms, sponge spicules, arenaceous foraminifera, and entomostracous skeletal fragments.

A sample from the deepest part of Loch Ard was a dark-grey mud, consisting principally of vegetable and clayey matter, the mineral particles not exceeding 10 per cent., with a mean diameter of about 0·1 mm. The organic remains observed were the same as in Loch Chon.

A fine-grained dark-brown mud from a depth of 60 feet in Loch Leven contained probably not more than 5 per cent. of mineral particles

Loch.	Elevation of surface above the sea.	Number of soundings.	Length.	Breadth, miles.		Mean breadth per cent. of length.	Depth.			Ratio of depth to length.		Volume, million cubic feet.	Area of loch.	Drainage area.	
							Feet.		Mean per cent. of max.						
	Feet.		Miles.	Max.	Mean.		Max.	Mean.		Max.	Mean.		Square miles.	Total in square miles.	Ratio to area of loch.
Chon ...	296	157	1·7	0·3	0·25	14·7	75	29·382	39·2	120	305	358	0·43	6·21	14·44
Lochan Dubh	286	25	0 2	0·12	0·09	45·0	41	20·700	50·5	28	56	0·6	0·018	0·32	17·77
Ard	105	308	2·3	1·1	0·41	17 8	107	43·863	41·0	113	277	1150	0·94	9·76	10·38
Lake of Menteith ...	55	375	1·6	1·0	0·64	40·0	77	19·770	25·7	110	427	562	1·02	6·35	6·23
Leven ...	350	538	3·65	2·6	1·45	39·7	83	14·869	17·9	232	1296	2195	5·30	50·92	9·61
		1403										4265·6	7·708	73·56	9·54

exceeding 0·05 mm. in diameter, the bulk of the deposit consisting of clayey and vegetable matter, containing many beautiful diatoms, with sponge spicules and entomostracan remains.

Temperature Observations.

The serial temperature observations taken in the lochs under consideration are given in the following table, but many temperature observations were taken at the surface which are not, of course, included in the table :—

Depth in feet.	Loch Chon.	Lochan Dubh.	Loch Ard.		Lake of Menteith.	Loch Leven.		
	May 15, 1900.	May 15, 1900.	Aug. 6, 1899.	May 16, 1900.	May 14, 1900.	June 11, 1900.	June 22, 1900.	Sept. 1, 1900.
	°	°	°	°	°	°	°	°
0	51·8	54·7	63·0	51·7	51·3	58·7	62·3	58·0
5	—	—	—	—	—	58·4	62·2	—
6	50·7	51·1	61·3	51·4	51·1	—	—	—
10	—	—	—	—	—	58·0	62·1	—
12	—	—	61·3	50·5	—	—	—	—
18	—	—	61·3	48·5	—	—	—	—
20	49·5	—	—	—	50·7	57·5	—	—
24	—	—	61·2	48·3	—	—	—	—
30	—	—	60·5	47·7	—	57·4	61·5	—
35	—	47·6	—	—	—	—	—	—
40	48·6	—	—	—	50·5	56·6	—	—
48	—	—	50·1	47·1	—	—	—	—
50	—	—	—	—	—	56·5	59·3	57·3
60	48·5	—	48·2	46·9	50·2	56·3	56·8	56·6
70	—	—	—	—	—	—	56·2	56 6
76	—	—	—	—	—	—	—	—
90	—	—	47·5	46·5	—	—	—	—
96	—	—	47·5	46·5	—	—	—	—
100	—	—	—	46·4	—	—	—	—

Loch Chon and Lochan Dubh.—These lochs were sounded on May 15, 1900, when the surface temperature in Loch Chon varied between 51·8° and 54·5°; below the surface the temperature decreased gradually down to 48·5° at 60 feet, so that the range observed throughout the whole body of water was only about 6°. In Lochan Dubh the surface temperature was slightly higher than in Loch Chon (54·7°), while the temperature of the deeper water was observed to be about 1° lower (47 6°), so that in the small body of water contained in Lochan Dubh the range was greater than in the larger Loch Chon, viz. 7°.

Loch Ard.—Loch Ard was visited on August 5 and 6, 1899, and again on May 16, 1900. The highest surface temperature (64·6°) was observed in the southern prolongation of the loch in August, the maximum temperature observed at the same time in the body of the loch proper being 63°. It will be seen that the whole body of water was warmer in August, and that a drop of 10° was recorded between the

depths of 30 and 50 feet, the extreme range of temperature from surface to bottom being 17°. No steep gradient was observed in May, the temperature decreasing gradually from top to bottom, the extreme range observed in May being 8·7°.

Lake of Menteith.—The Lake of Menteith was visited on August 7, 1899, and May 14, 1900. No serials were taken in August, when the surface temperature varied only from 62·2° to 63·2°. In May the surface temperature varied from 51·1° to 52·2°, and the temperature decreased gradually from surface to bottom, the range observed in May throughout the whole body of water being only 2°—from 50·2° to 52·2°; the extreme range shown by all the observations amounts to 13°.

Loch Leven.—Loch Leven * was sounded on June 11, 12, and 22, 1900, and again on September 1 and October 23. A reading at the surface on June 11, at 5 p.m., gave 58·7°, and on June 12, at 4.50 p.m., a temperature of 67·5° was observed—a range of nearly 9° in one day. This reading of 67·5° may be specially referred to as being, so far as we are aware, the highest temperature hitherto recorded in the waters of Scottish lochs, the next highest reading being one of 65° observed by Mr. Scott at the surface of Loch Oich in August, 1897. In September the surface temperature ranged only from 57° to 58·5°. We are doubtful as to the working of the thermometer made use of in the October visit, and the readings have therefore not been included in the table.

The serials taken in June indicate the rapidity with which the waters of a shallow lake like Loch Leven become heated up in summer. During the eleven days between June 11 and 22 the whole body of water had acquired a higher temperature, amounting to about 4° in the upper layers down to 30 feet, to nearly 3° at 50 feet, and to half a degree at 60 feet. Thus, while the body of water in a shallow lake absorbs heat more rapidly than that in a deep lake, it also loses heat more rapidly, and therefore the quantity of heat stored up in the waters of a deep lake may not be less than that stored up in the waters of a shallow lake, as Delebecque † seems to think. From a preliminary study of our temperature observations in the Scottish lochs we believe the reverse to be the case. For instance, Loch Katrine and Loch Leven are comparable as regards superficial area, but Loch Katrine is six times as deep as Loch Leven, and contains twelve times as much water; if the temperature of the water in the two lochs were taken simultaneously before and after a definite interval in summer, it seems probable that, while the temperature in Loch Leven might have been

* We understand that the temperature of the water of Loch Leven has been taken at the pier once a day (at 12 noon) during the five months of the fishing season for the past twenty-five years, but we have had no opportunity of examining the observations.

† "La quantité totale de chaleur emmagasinée dans un lac variera d'autant moins que ce volume sera plus grand par rapport à cette surface" ('Les Lacs français,' p. 150).

raised much higher than in Loch Katrine, the amount of heat stored up, as represented by the number of cubic feet raised 1°, would be found to be greater in Loch Katrine than in Loch Leven, and that the difference would bear some relation to the ratio between the bulk of water and the area of surface exposed to the rays of the sun. We shall endeavour to work this matter out in greater detail as our temperature observations accumulate, and we may return to the subject in a later paper.

Pelagic and Other Organisms.

The tow-net collections taken in the lochs now under consideration have not yet been worked up, and we therefore limit our remarks in this paper to the results obtained by Mr. Scott in Loch Leven in 1890, 1897, and 1898.*

In June, 1890, Mr. Scott found the fauna to be abundant and varied —Mollusca, Arthropoda, Annelida, and Protozoa being more or less common all over the loch. Mollusca were common and generally distributed, except at that part of the loch called the "Shallows," the bottom of which consists of little else than fine sand, and is therefore not so suitable as a habitat for these organisms as where the bottom consists of mud or vegetable *débris*. Fourteen species of Mollusca were obtained, comprising five Lamellibranchs and nine Gasteropods. The more common forms were *Sphærium corneum*, *Pisidium fontinale*, *Valvata piscinalis*, and *Planorbis contortus*. The swan-mussel (*Anodonta cygnæa*) appeared also to be frequent.

The Crustacea were by far the most numerous and varied of the invertebrate fauna of the loch. Cladocera and Copepoda occurred in great profusion all over and through the water. *Daphniæ* were most abundant. *Cyclops*, especially *C. strenuus*, was also plentiful. Ostracoda were not so common in the loch itself as they were around its margin, particularly those parts that were more or less overgrown with vegetation, as round the north-east shore. Seventeen species of Ostracoda were obtained along this part of the shore; twelve species were obtained from the south shore, and only eight from the loch itself. Among the Cladocera the rare and interesting *Leptodora hyalina* occurred in considerable numbers; *Monospilus tenuirostris* was also frequent in the material collected at one or two places. The following were the common species: *Gammarus pulex*, *Diaptomus gracilis*, *Cypria serena*, *C. ophthalmica*, *Limnicythere sancti-patrici*, *Daphnia lacustris*, *Pleuroxus trigonellus*, *Chydorus sphæricus*.

The larvæ of insects were abundant in the loch, especially the larvæ of the Iphemeridæ. The Libellulidæ and Phryganidæ were also represented in the larval stage more or less frequently. Some idea may be

* See *Ninth* and *Seventeenth Annual Reports of the Fishery Board for Scotland*, part iii. 1890 and 1899.

formed of the myriads of these organisms present in the loch when it is stated that a conspicuous ridge composed of cast-off skins of insect larvæ, which had been washed ashore during the preceding stormy weather, extended along the margin of the loch for a considerable distance. The curious so-called "water-bears" (Tardigrada), now included in the class Arachnida, were common among the decaying vegetable matter at the bottom. Species of Notonectidæ, or "water-bugs," and of aquatic Coleoptera were also more or less common, though their distribution seemed to be more localized.

The worms were represented by several species—parasitic and non-parasitic. Among the former were *Schistocephalus solidus*, obtained from the body-cavity of a Stickleback (*Gasterosteus aculeatus*), and a species of tape-worm (*Bothriocephalus latus ?*), several of which were found in the alimentary canal of the trout, six specimens being taken from one fish. The heads of the parasites were fixed at the extreme end of the *cæca* or blind tubes of the stomach, and their bodies were so elongated as to extend well down into the intestine. Usually one parasite occupied a *cæcum*. *Tubifex rivulorum* was very common in the loch.

Rhizopoda were common all over the loch. Several forms were obtained in the dredged and hand-netted material; the more typical varieties observed were:—*Difflugia pyriformis*, *D. globularis* (much less frequent than the first named), *D. corona* (appeared scarce), *D. marsupiformis* (of frequent occurrence). Diatomacea were abundant, especially in the deeper parts of the loch, and included a considerable number of species.

Mr. Scott visited Loch Leven again in September and December, 1897, and in March and June, 1898, when he found that the free-swimming Entomostraca, though very abundant, consisted mainly of the one species, *Daphnia lacustris*. *Leptodora hyalina* was moderately common in the September gathering, but was not observed in any of the other three. *Diaptomus gracilis* was frequent in the gathering collected in December, but was scarce in the others. *Bythotrephes longimanus*, though present in both the September and June gatherings, was not observed in those collected in December and March. *Cyclops strenuus*, though present in all the gatherings, was scarce.

A few male *Daphniæ* were observed in the December gathering, but in none of the others; females with *pseudova* were frequent in all the gatherings. When the loch was examined in June, 1890, both *Daphnella brachyura* and *Polyphemus pediculus* were observed in the tow-net gatherings, but neither of these species was obtained in any of the gatherings recently collected. Infusoria and micro-algæ, which were moderately frequent on the first three occasions when the loch was examined, were quite abundant in the loch in June, but these minute forms did not appear to be generally diffused, apparently occurring in shoals, and being particularly plentiful to the south of Reed Bower.

The examination of the shore yielded a much greater number of species than were captured by the tow-nets, but individuals were not nearly so numerous. Fifty-five species of Crustacea were obtained in the shore gatherings collected during the recent experiments. The records of species obtained when the loch was examined in 1890 include a few that were not observed in the recent gatherings (viz. *Cypria exsculpta*, *Candona lactea*, *Ilyocypris biplicata*, *Bosmina longirostris*, *B. longispina*), and if these and the species captured with the tow-nets be added, they increase the number of crustacean species to sixty-five; it is quite probable that even this number will yet be added to when the loch comes to be more thoroughly examined. Only five species were observed in all the gatherings in 1890, 1897, and 1898, viz. *Canthocamptus staphylinus*, *C. minutus*, *Cypria ophthalmica*, *Candona candida*, *Chydorus sphæricus*. The species recently captured include one Amphipod (*Gammarus pulex*), and eighteen each of Copepoda, Ostracoda, and Cladocera. The largest number of species of Crustacea obtained in any of the recent shore gatherings from Loch Leven was in that collected on June 13. This gathering yielded thirty-nine species, or only four less than the total number observed in the tow-net and hand-net gatherings collected in June, 1890.

The Cladocera, as a whole, were scarcer in those gatherings collected in the colder months than in the others. It may also be stated that in March the level of the water was much higher than during any of the other visits, and this no doubt accounted, partly at least, for the great scarcity of Cladocera in the gathering collected at that time; the reduced temperature incidental to the season may also have had some influence in bringing about this result.

Notes on the Geology of the District around Lochs Chon and Ard.

By Messrs. Ben. N. Peach, F.R.S., and John Horne, F.R.S., from unpublished observations made during the course of the Geological Survey of Scotland.

Published by permission of Sir Archibald Geikie, D.C.L., F.R.S., Director-General of the Geological Survey of the United Kingdom.

Loch Chon.—Loch Chon is a striking example of a rock basin. The upper portion of the lake is floored by mica-schists, and the lower portion by the Ben Ledi grits and schistose epidotic grits ("Green Beds"), the members of the two latter groups being repeated by sharp folds.* The trend of the loch—N.N.W. and S.S.E.—is oblique to the strike of the strata. At the head of the lake there is a broad alluvial flat, where it has been silted up for a distance of one-third of a mile by the detritus laid down by the adjacent streams. In the northern part of the basin the deepest soundings vary from 33 to 37 feet; but at a

* *Geographical Journal*, vol. xv. p. 342.

point about half a mile below the present head of the lake the depth increases from 40 to upwards of 60 feet. This feature coincides with a line of fault that crosses the loch in a north-east and south-west direction, its downthrow being to the south-east. From this point southwards for half a mile there is a narrow basin enclosed within the 50-feet contour-line, and within this basin there is a narrow trough, about 100 yards long and upwards of 75 feet deep, near the west margin of the lake. There is ground for the belief that nearly the whole of the basin bounded by the 50-feet contour-line is floored by mica-schist.

About a mile below the head of the lake the soundings prove a remarkable decrease in the depth, the 25-feet contour-line near the Heron islands being deflected towards the centre of the loch. The shallowing of the basin here takes place along the outcrop of very massive epidotic grits ("Green Beds"), several glaciated rocky islands appearing along this line. Southwards to the mouth of the lake there are alternations of Ben Ledi grits and schistose epidotic grits, the narrowest parts of the lake coinciding with the exposures of the latter group.

About 100 yards below the outlet of the lake a prominent band of schistose epidotic grits occurs, which evidently formed a rocky barrier during the glaciation of that region. Beyond this outcrop there is a small shallow basin, about 41 feet deep (Lochan Dubh), floored by schistose grits, which is traversed by a fault trending north-east and south-west, with a downthrow to the east. Across the mouth of this basin a band of massive pebbly grits of the Ben Ledi type has been traced.

A reference to the geological map accompanying Part I. will show that the direction of the ice-flow during the great glaciation coincides generally with the trend of the loch, striæ being found on the rocky islands as well as round the margin of the lake. The evidence supplied by the soundings tends to support the theory that the basin-shaped hollow has been eroded by ice-action. The dislocations referred to above have doubtless produced local modifications of the floor of Loch Chon, and of that of the small basin (Lochan Dubh), but they do not account for the excavation of the basin.

Loch Ard.—Loch Ard is also a true rock basin, which lies along the outcrop of a belt of slates between two bands of grit, the deepest part of the loch, as proved by the soundings, coinciding with the outcrop of the slates.

From the Mill of Chon downwards to the head of the lake there is a small alluvial flat pointing to the former extension of the loch in that direction. At the upper end the soundings show that the average depth is 25 feet, with the exception of one small depression opposite Ledard burn, reaching 57 feet in depth. Eastwards, where the loch becomes

narrower, the depth increases. The basin enclosed by the 50-feet contour-line is 1½ miles long, while that surrounded by the 100-feet contour-line is three-quarters of a mile in length, the deepest sounding being 107 feet.

The dislocation, with a downthrow to the east, that crosses the loch in line with Allt-na-Sgéith in a north-east and south-west direction has not produced any local modification of the floor of the lake, if we may judge by the soundings. The 100-feet basin crosses this fault without any apparent increase in depth on the side of downthrow, which is probably due to the fact that the dislocation brings slates into contact with slates. The band of massive grit which forms for a long distance the southern margin of the loch evidently acted as a barrier during the period of glacial erosion. Crossing the lake at Briedach, this band of grit forms the promontory south-east of Glashart.

On referring to the geological map in Part I. it will be seen that the band of grit just described is followed southwards by slates, the outcrop of which coincides with an expansion of the loch at its outlet, the deepest sounding being 52 feet. About 600 yards to the east of the outlet, the trend of the latter belt of slates is east-north-east, and here occurs another small basin upwards of 30 feet in depth.

No ice-markings have been found round the margin of the loch or near it, but about half a mile to the south of the upper end of the lake the direction of the striæ is E. 20° S., which coincides generally with the long axis of the loch. Reference was made in the former paper to the more easterly movement of the ice as it left the mountainous region and approached the low-lying districts; the course of Loch Ard coincides with this easterly trend of the ice.

From the evidence adduced it is obvious that the geological structure of the basin of Loch Ard has had an important influence in the development of its present features, the latter being adequately explained by the theory of glacial erosion.

The Lake of Menteith lies in various superficial deposits, composed partly of boulder-clay and stratified beds of the 100-feet beach. It is within the area occupied by the Old Red Sandstone, and the solid rock is visible only at one locality, at Coilledon. Loch Leven likewise lies in superficial deposits.

Part III.—The Lochs of the Tay Basin.

1. *Lochs Ericht and Garry.*

Introduction.

It is proposed to publish the results obtained in the lochs forming part of the drainage basin of the Tay as ready, and in this first instalment we shall deal with Lochs Ericht and Garry. The general conclusions will be reserved until the lochs of the whole basin have been

surveyed. We have referred in Part I. to Mr. Grant-Wilson's work on some of the lochs of the Tay basin; he has kindly supplied us with copies of his maps showing the soundings taken by him. We propose, as opportunity offers, to take soundings supplementary to, and corroborative of, those taken by Mr. Wilson, and indeed we have already taken about 150 soundings in Loch Earn. The geology of the district around Lochs Ericht and Garry has not yet been systematically worked out, and therefore any notes by Messrs. Peach and Horne will be reserved until the completion of the survey of the lochs in the basin.

Maps and Illustrations.

This part is illustrated by three maps and a temperature diagram. The maps are drawn to the same scale as has been adopted for the whole series, viz. 3 inches to the mile (1 : 21,120), the majority of the soundings being given in feet. The intervals between the contour-lines of depth are indicated by different shades of blue, and the intervals between the contour-lines of height of the neighbouring country by shades of brown.

Plates I. and II. show Loch Ericht, which, in order to avoid an extremely long map, has been cut into two portions, the contour-lines of depth being drawn in at 50, 100, 200, 300, 400, and 500 feet.

Plate III. is a longitudinal section of Loch Ericht, showing the distribution of temperature as observed on June 15 to 20, 1900; this will be referred to in greater detail under temperature observations.

Plate IV. shows Loch Garry, the contour-lines of depth being drawn in at 25, 50, 75, and 100 feet.

Depths of the Lochs.

Loch Ericht.—Loch Ericht is a large Highland loch situated partly in Perthshire and partly in Inverness-shire, at a high elevation among the Grampians. It is one of the wildest and most magnificent lochs of Scotland, presenting all along its shores scenes of lonely grandeur and sublimity, the mountains rising from the water's edge to great altitudes, their sides scarred by mountain torrents. The surface, when measured by the Ordnance Survey officers in 1872, was found to be 1153·4 feet above the level of the sea; it is thus one of the most elevated of the larger Scottish lochs. It is known to anglers as the home of large *Salmo ferox*, as well as of trout said to be equal in quality to those of Loch Leven. It trends in a north-east and south-west direction, and is broadest near the southern end, narrowing gradually towards the northern end. It is over 14½ miles in length, and over 1 mile in maximum breadth; the mean breadth is about half a mile, being 3½ per cent. of the length. Its waters cover an area of over 4600 acres (or nearly 7¼ square miles), and it drains an area seven times greater, or over 32,000 acres (nearly 50½ square miles). The total number of

soundings taken in Loch Ericht was 488, which show that it is a comparatively deep loch, the greatest depth observed being 512 feet. The mass of water contained in the loch is estimated at 38,027,000,000 cubic feet, and the mean depth at 189 feet, being 37 per cent. of the maximum depth. The length of the loch is 150 times the maximum depth, and 405 times the mean depth.

The deepest part of the loch is in the southern broader portion, where, about $3\frac{1}{2}$ miles from the foot of the loch, there is a small central depression, about one-third of a mile in length, and covering about 58 acres, in which the depths exceed 500 feet, the maximum being 512 feet. There are two 400-feet depressions, the larger, about three miles in length, reaching to about $1\frac{1}{2}$ miles from the southern end, and enclosing the 500-feet depression. Separated by about a quarter of a mile from the northern end of the large 400-feet depression is the second smaller isolated depression, in which the maximum depth is 410 feet. There are two 300-feet depressions, the larger in the southern portion of the loch, the smaller in the northern portion. The southern depression is over $4\frac{1}{2}$ miles in length, and encloses the deepest water in the loch. The northern smaller depression is under one mile in length, with a maximum depth of 314 feet, and approaches to within $2\frac{1}{2}$ miles of the head of the loch. There are two 200-feet depressions; the larger runs from within a mile of the southern end to more than halfway towards the northern end, being over 7 miles in extreme length. It is separated from the northern 200-feet depression by an interval of $2\frac{3}{4}$ miles, in which the depth varies from 127 to 194 feet. The northern 200-feet depression is nearly $2\frac{3}{4}$ miles in length, approaching to within about $1\frac{1}{4}$ miles from the northern end, and enclosing the small northern 300-feet depression already mentioned. The 100-feet depression is a continuous area extending from within less than half a mile of the southern end to within less than a mile of the northern end, and is about $13\frac{1}{4}$ miles in total length. The 50-feet depression follows approximately the contour of the loch. Opposite Loch Ericht Lodge an isolated sounding of 44 feet was observed between the 50- and 100-feet lines, and about $1\frac{1}{2}$ miles farther down, opposite the entrance of the Allt Càmus nan Cnàmh, another isolated sounding of 20 feet was taken, surrounded by deeper water.

The area of the bottom of the loch lying between the shore and the 50-feet line is estimated at about 880 acres (or 19 per cent. of the total area of the loch), that between the 50-feet and 100-feet contours is estimated at 695 acres (or 15 per cent.); that between the 100- and 200-feet contours is estimated at about 1160 acres (or 25 per cent.); that between the 200- and 300-feet contours at about 875 acres (or 19 per cent.); that between 300 and 400 feet at 476 acres (or over 10 per cent.); that between 400 and 500 feet at about 474 acres (or over 10 per cent); and that over 500 feet at 58 acres (or $1\frac{1}{4}$ per cent.).

It will thus be seen that Loch Ericht is of very simple conformation.

The deeper parts are divided into two basins, by the constriction in the outline of the loch in the vicinity of Loch Ericht Lodge, where, in one place, it is less than a quarter of a mile in width, but even here the depth in the centre exceeds 100 feet.

Loch Garry.—Loch Garry * lies to the east of Loch Ericht, at a still higher elevation, and the scenery round about is very wild; the height of the surface of the loch above sea-level is not given on the Ordnance Survey map, but a height of 1326 feet is shown near the outlet, so that the level of the loch is probably about 1320 feet above the sea. In trend and in outline it somewhat resembles Loch Ericht, narrowing towards the northern end. It is over $2\frac{1}{2}$ miles in length, the maximum width being over a quarter of a mile; the mean breadth is slightly under a quarter of a mile (being 9 per cent. of the length). Its waters cover an area of about 390 acres (three-fifths of a square mile), and it drains an area 37 times greater (or about $22\frac{1}{3}$ square miles). The total number of soundings taken in Loch Garry was 141, the maximum depth observed being 113 feet. The mass of water contained in the loch is estimated at about 846,000,000 cubic feet, and the mean depth at nearly 50 feet (being 44 per cent. of the maximum depth). The length of the loch is 119 times the maximum depth, and 260 times the mean depth.

Loch Garry forms a simple basin, except that the bottom sinks into two depressions exceeding 100 feet in depth, separated by depths of 82 to 93 feet. The larger but shallower depression is situated in the southern half of the loch, and is over a quarter of a mile in length, the maximum depth observed therein being 105 feet. The smaller but deeper depression is situated in the northern half of the loch, being only about one-sixth of a mile in length, and containing the maximum depth of the loch—113 feet. The 75-feet, 50-feet, and 25-feet depressions form continuous areas, following approximately the outline of the loch. The 75-feet depression is nearly $1\frac{3}{4}$ miles in length, the 50-feet depression nearly 2 miles in length, and the 25-feet depression $2\frac{1}{8}$ miles in length.

The area of the bottom between the shore and the 25-feet contour-line is about 117 acres (or 30 per cent. of the total area of the loch); that between the 25- and 50-feet contour-lines is about 83 acres (or 21 per cent.); that between 50 and 75 feet is almost the same; that between 75 and 100 feet is about 87 acres (or 22 per cent.); and that over 100 feet is about 19 acres (or 5 per cent.).

The details regarding the physical features of Lochs Ericht and Garry are collected together in the table opposite.

Deposits.

The deposits from Loch Ericht are interesting because of the evidence of layers of different colours. At a depth of 50 feet a red sandy

* This loch must not be confounded with the larger Loch Garry in Inverness-shire.

Loch.	Elevation of surface above the sea.	Number of soundings.	Length.	Breadth, miles.		Mean breadth per cent. of length.	Depth.			Ratio of depth to length.		Volume, million cubic feet.	Area of loch.	Drainage area.	
							Feet.		Mean per cent. of max.						
	Feet.		Miles.	Max.	Mean.		Max.	Mean.		Max.	Mean.		Square miles.	Total in square miles.	Ratio to area of loch.
Ericht ...	1153	488	14·5	1·0	0·50	3·5	512	189·201	37·0	150	405	38,027	7·21	50·39	6·99
Garry ...	1320	141	2·55	0·3	0·24	9·4	113	49·910	44·2	119	270	846	0·61	22·34	36·62
		629										38,873	7·82	72·73	9·30

mud was obtained; at 112 feet the mud was white beneath and brown on top; at 124 feet it was all brown; at 153 feet all brown; at 182 feet sandy and white; at 184 feet white and brown; at 245 feet the deposit was a light-coloured mud, with a thin brown layer 1 inch in thickness on the top; at 270 feet it was white below, black-brown above; at 366 feet the mud was all dark-brown; at 385 feet there was a white clay or mud, with a dark layer on the top; at 456 feet the mud was all black; at 497 feet a section of black mud 5 inches in thickness was obtained; and at 510 feet the same black mud was found, without any trace of the lighter-coloured mud.

The sand from 50 feet consisted largely of mineral particles (probably 70 per cent. of the whole deposit) with a mean diameter of about 0·6 mm., one or two rock fragments attaining a diameter of 7 mm. The remainder of the deposit consisted of clayey and vegetable matter, with minute mineral particles less than 0·05 mm. in diameter, diatoms, sponge spicules, and entomostracous skeletal remains. The light-brown mud from 150 feet contained about 30 per cent. of mineral particles, with a mean diameter of 0·5 mm., the largest being 5 mm. in diameter, with clayey and vegetable matter, and organic remains as previously mentioned. The dark-brown mud from 366 feet contained only about 10 per cent. of mineral particles (quartz, black and white mica, etc.) exceeding 0·05 mm. in diameter, the mean diameter being about 0·2 mm. Samples of the two different coloured layers of mud from a depth of 385 feet were submitted to analysis, with the following results:—

	Bottom layer.	Top layer.
Organic matter	10·00 per cent.	26·8 per cent.
Insoluble residue	73·70 „	57·6 „
Iron oxide	13·64 „	17·2 „
	97·34	101·6

These analyses seem to show that the upper layer contained more organic matter (presumably vegetable matter) and a little more iron than the lower layer. Microscopic analysis of the two layers indicates that the mineral particles were rather more numerous and larger in the top layer, while the clayey matter seemed to be more abundant in the lower layer.

Temperature Observations.

The serial temperatures taken while sounding out Lochs Ericht and Garry in June, 1900, are given in the following table, and those taken in Loch Ericht are shown graphically in the temperature section (Plate III.) accompanying this paper, since they are extremely interesting as illustrating the effect of the wind upon the distribution of temperature.

Depth in feet.	Loch Garry.	Loch Ericht.					
	June 21, 1900.	June 19, 1900, ¼ mile from S. end.	June 20, 1900, 1¼ miles from S. end.	June 20, 1900, 3¼ miles from S. end.	June 16, 1900, 9¼ miles from N. end.	June 15, 1900, 5¼ miles from N. end.	June 20, 1900, 1 mile from N. end.
	°	°	°	°	°	°	°
0	57·0	47·3	49·0	50·0	50·0	53·2	55·1
5	—	47·0	48·7	49·7	—	—	—
6	—	—	—	—	50·0	—	—
10	56·9	47·2	47·8	49·5	—	—	—
25	—	—	—	—	49·9	—	—
30	49·5	46·1	47·5	48·6	—	—	54·2
40	—	—	—	45·8	—	—	—
50	—	44·6	44·7	44·7	44·8	—	52·3
60	46·3	43·4	—	—	—	—	—
75	—	42·6	43·2	—	—	—	44·0
98	—	—	—	—	—	41·5	—
100	—	42·2	—	42·9	42·6	—	—
105	46·0	—	—	—	—	—	—
120	—	—	—	—	—	—	42·7
150	—	41·3	—	—	—	—	—
200	—	—	—	41·0	41·1	—	—
300	—	—	—	40·7	40·5	—	—
400	—	—	—	40·5	40·5	—	—
500	—	—	—	40·5	—	—	—

Loch Ericht.—Like Loch Katrine, Loch Ericht is said never to freeze over, and the surface temperature remains comparatively low throughout the summer. The surface temperatures taken in Loch Ericht during the visit from June 15 to 20 show a range of 10·4°, viz. from 46·6° to 57°; the higher temperatures were obtained towards the northern end of the loch, and the lower temperature towards the southern end of the loch. A glance at the temperature section (Plate III.) based upon the observations given in the table shows that the warmer water was all collected towards the upper end of the loch, as the result of a south-easterly wind which blew at times during the six days that were devoted to the survey of the loch, colder water having been drawn up at the opposite end of the loch to supply the place of the warmer surface water driven before the wind.

Loch Garry.—Loch Garry was visited on June 21, 1900, when the surface temperature was found to vary from 57° at the south-west end to 59·4° at the north-east end, and this would seem to indicate a distribution of temperature similar to that observed in Loch Ericht, but since only one temperature series was taken, it is impossible to form an idea of the distribution of temperature throughout the whole body of water.

PROF. FOREL ON LIMNOLOGY.

By HUGH ROBERT MILL, D.Sc., LL.D.

THE appearance of a handbook of Limnology * may be looked upon as the formal admission of the science of lakes to its independent position somewhere on the borderlands of geography, very near the place occupied by oceanography. Prof. Forel is the one man capable of writing such a book—at least, that is what we believe to be the opinion of every limnologist but one, the exception being Prof. Forel himself. In the preface he explains his views on the subject of text-book writing so persuasively, that one turns back to the title-page in some trepidation for confirmation of the authorship. A handbook, he says, should be an impartial and impersonal treatment of a subject, a measured and critical statement of facts and theories free from the particular bias inevitable to one who has himself worked at the science from the commencement. He goes on to say—

"My relation to limnology is much too personal and subjective for me to be able to give an objective presentation of the facts. I asked the editor of the series to consider this; I pointed out that a geographer who had perhaps never set foot in a boat or hauled a dredge, but who had studied limnology just as he had studied the other branches of physical geography, would be far better fitted than I for such a work. . . . The editor was not of my opinion."

The book was written in French, and translated by Prof. Wilczek, the author's happy style being very successfully rendered in the heavier language. The English reader has the advantage of getting a new view of the technical French terms used by the author in his great monograph on the Lake of Geneva, which are here authoritatively given in German also, and from the two an English equivalent can be more easily supplied than from either alone.

With regard to the systematic position of limnology, Prof. Forel gives the following definitions, and introduces the following terms:—

"Geography is the science of the Earth in its threefold composition of lithosphere, hydrosphere, and aërosphere. The special study of the hydrosphere is hydrography. Liquid water appears in three ways upon the Earth—in the sea, in lakes, and in rivers; and hydrography is correspondingly divided into the three departments—

"Oceanography, which is occupied with the unlimited, united, and all-embracing ocean.

"Limnology, which is concerned with the scattered and isolated portions of the hydrosphere occurring upon the land as lakes.

---

* Handbuch der Seenkunde. Allgemeine Limnologie von Dr. F. A. Forel. (Bibliothek geographisches Handbücher herausgegeben von Prof. Dr. Friedrich Ratzel.) Stuttgart: J. Engelhorn. 1901.

"Rheology, which studies the running water of the land in springs, brooks, streams, and rivers.

"If we include solid as well as liquid water with the hydrosphere, then a fourth subscience, Glaciology, must be added."

Stress is laid on the fact that limnology may be viewed as oceanography in miniature, but that, on account of the diversity and individuality of lakes, there is a special limnology for every lake-basin, each lake being looked upon as a microcosm.

In a handbook of moderate dimensions it would be impossible to go into the detailed studies which have been made of innumerable lakes all over the world, and the author has very wisely limited himself to the task of stating in a clear and logical way the general principles and leading facts which apply to all lakes. How comprehensive these are may be gathered from the following condensed summary.

Part I. deals with lake-basins, considering the origin of the primitive hollow * in which water came to collect, the principle of hydrographic charts to delineate them, the grouping of lakes in special districts, the change of the primitive hollow into a lake-basin by the action of the water of the lake itself and of tributaries, and on the nature and formation of lacustrine deposits. The first part ends with an outline of limnometry, or the methods of lake-measurement, and a statement as to the classification of lakes by their relation to the general progress of change, during which they may successively be classed as young, mature, old, and dead.

The second, and much the longer, part deals with the water of lakes, as regards its economy, or the relation between gain by inflow and loss by outflow and evaporation; hydraulics, or the movements of water by waves, seiches, and currents; the chemical, thermal, optical, and finally the biological conditions. The chapter on thermal conditions is of special interest, as it contains a system of classifying deep lakes according to what we may call the climate of their deep water into a tropical series, where the bottom temperature is always higher than the maximum point, 39° Fahr.; the temperate type, where it is constant at 39°; and the polar type, where it is always below 39°.

The Biological chapter introduces a terrible plexus of terminology, which, in contrast to the simple clearness of the physical part, suggests that there may be a new danger of darkening counsel by words with too much knowledge. Thirty-seven composite terms are defined separately, each containing or qualifying the word "plankton," and designed to specify every possible variation in habitat, form, or mode of life of the drifting organisms in lakes. For example, the Morphoplankton,

* *Wanne* or *Cuvette*, literally *tub* or *basin*, but the English word "basin" is reserved as the equivalent of *Becken* and *Bassin*, and "tub" is too colloquial, and apt to be confounded with "trough," which corresponds to *Mulde*.

which are a division of the Euplankton, are in turn subdivided into the Raphidoplankton, Skaphoplankton, Desmoplankton, and Kremastoplankton. They at least suggest that the initiator of the resounding series "was a scholar and knew Greek." Prof. Forel says of it all—

"Are these foreign words ever necessary? It is seldom that an idea or a fact cannot be expressed in familiar language. New words, even when they are not absolutely necessary, are often very convenient for their coiner, but they are usually only useless ballast to the reader. . . . If our beautiful science is not to become repulsive, we must abstain from disfiguring it by the introduction of too many foreign words, and take care that limnology be not made incomprehensible to the many general readers interested in the study of lakes by the use of such expressions."

A very brief bibliography completes the volume, but, though it contains few entries, it records the sources where bibliographies of the subject appear periodically. There is a serious omission, however, in the shape of the "Geographical Literature of the Month" in the *Geographical Journal*, which contains as full a record of the progress of limnology as any of the German and French works which are cited.

ROCKHILL'S 'RUBRUQUIS.'—REVIEW.

By C. RAYMOND BEAZLEY.

THE Hakluyt Society has published this year a new version of the Journey of William of Rubruck, or Rubruquis, the Itinerary of John de Plano Carpini (Pian de Carpine), and the Narrative of Benedict the Pole. Mr. W. W. Rockhill, the editor, has accompanied his translation with many useful notes, and an introduction that provides a good summary of the great movement of missionary and diplomatic travel from the Christian to the Mongol courts in the middle of the thirteenth century. The translator's knowledge of Chinese, Mongol, and Tibetan sources has enabled him to throw additional light on several passages, and, with some exceptions, he has taken into account all the leading Western authorities.

It seems ungracious to criticize a work which has absorbed so much of the time of a public man, and in which there is so much valuable information, but Mr. Rockhill himself would be the last to wish for a merely formal reception of his edition from those who have consulted it. We may venture to suggest for his consideration the following points: Has he, while approaching Rubruquis, so to say, from the side of China, Mongolia, and Tibet, given sufficient attention to his author from the side of Russia? Has he not also, in pleading for a proper sense of his author's great and undoubted merits (undoubted now,

whatever they were in the past), greatly under-estimated John de Plano Carpini? As to the former point, Mr. Rockhill obviously does not pretend to deal with the Western or Russian aspect of Tartar conquest and Rubruquian travel as he deals with the Eastern; here, therefore, he is occasionally led into misconceptions, and his spelling of Russian names and references to Russian geography and history are not always satisfactory. Thus, on pp. 3, 4, 8, etc., we have Kiew, Danilow, Alexandwsk; but also Volga and Vladimir, like Saratov on p. 121; again, the isthmus of Perekop is not the sole connection between the Crimean peninsula and the mainland, as seems implied on p. 92, note; and it should not be suggested, as on p. 100, that the *Kerkis*, Cherkess, or Circassians any longer occupy the Caucasian slope of the Black Sea and Sea of Azov. As to Carpini, he surely has a right to the indulgence of all modern readers who fairly consider his work of exploration, the immensity and daring of his journey, his pioneer position among the Friar travellers of the thirteenth century, his revelation of "Scythia" to the Christian and Latin world, his admirably lucid and informing narrative, his superiority to all other mediæval writers *de moribus Tartarorum*, as the first European ethnologist of Central and Northern Asia. If, in the case of Rubruquis, we must "be to his faults a little blind, and to his virtues very kind," why should not Friar John have the same privilege? Thus, while the latter is rather severely dealt with for his confusion about the sea into which the Volga and Ural rivers flowed, the former is praised (p. 97) for "correctly locating the sources of the Don" at Ivan lake, in Tula province, whereas he really derives the Tanais from the Mæotid Fens extending to the ocean in the north. The ever-recurrent and sometimes excessive obscurity of Rubruquis' language (as in the reference to Sartach on p. 256) might surely have been admitted and contrasted with the illuminating clearness of John de Plano. And it seems to be straining the point to ignore or deny (p. 42, 109) that Carpini mentions the Turks, when he names *Turkia* and the Sultan of Rûm. The excellent description of the people of Cathay (quoted on p. 155, n. 1), as well as the account of Mongol views on a future life, so curiously similar to those of the American Indians (quoted on p. 54, n. 1), are among many (over fifty) passages cited by the editor from Carpini, which not only illustrate the text of Rubruquis, but themselves establish beyond cavil the value of that John "of Polycarp," whom Friar William misnames and utilizes.

To come to a lesser matter: Would it not have been better, in a version which does not attempt to be archaic, to relegate to the footnotes such archaic forms as *H*ermenia, Turk*ie*, Turk*e*mans, *Y*conium, *S*ilicia, Eu*f*rates, *Curges* and *Cu*rgia, Cata*l*ogna, Tefilis, Mulihec, A*x*asins (pp. 118, 271, 275, 280, etc.)?

The repeated and rather emphatic references to Mandeville (*e.g.* p. 120, 122), as if an independent authority of some weight, are

surprising; the *agriobous* of Cosmas ('Christian Topography,' 360) is only by conjecture, and perhaps questionably, identified with the yak (p. 151, n. 1); Rubruquis' *supertunicale diaconi* cannot well be translated *chasuble*, as on p. 153; *books*, on p. 253, is a misreading for *children* (*libros* for *liberos*); the name of *Seres*, as derived from a city, may surely be traced further back than Isidore (p. 155); Jor*dan*es is a preferable form to Jor*nan*des (pp. 42, 100, 157); *ick*on is apparently a misformation for *i*kon or *ei*kon (on 272, n. 1); and it is not easy to see how an eikon could be mistaken for a cross, as the editor suggests. Again, the feast of St. Mary Magdalene is not June 22, but July 22 (p. 96); and the *Sentences* which Rubruquis mentions among the books of which he was specially fond (p. 106) are probably the famous work of Peter Lombard, the *Magister Sententiarum*, and not a "breviary." It seems an exaggeration to say (p. 119, n. 2) that all Herodotus' successors down to Ptolemy believed the Caspian to be an inlet of the ocean; nor was the sea of Aral quite "unknown to the ancients" (p. 131, note 2); for Ammianus Marcellinus apparently refers to it; while Ptolemy's *Oxiana palus* may conceivably be meant for the same. Lastly, a more careful revision of the proofs would probably have discarded the forms and phrases Lep*i*nsk, south of *Baikal*, for Leps*i*nsk, south of *Balkhash* (p. 139, n.); Mic*h*el for Mic*ha*el, or Mi*kh*ail (p. 135); *Iu*gurs for *Ui*gurs (p. 234, cf. 147, etc.); *Ca*pchac and *Ca*pcha*t* (pp. 92, 93, 101) for *Ki*pcha*k*; Poli-carp for Poly*c*arp (p. 123); *Tului* for *Juchi* (p. 122); patene for paten (p. 216); pa*i*ling for pa*l*ing (p. 220); co*u*rt for co*a*st (p. 201); Ty*r* for Ty*re* (p. 51); lent for Lent (p. 11); and also the "second Sunday of Quadragesima" (pp. 272, 273) would doubtless have been replaced by the more usual form, if the editor had had time and opportunity thoroughly to overhaul this volume, for which all students of mediæval geography owe him their sincere and cordial thanks.

THE MONTHLY RECORD.

EUROPE.

The Origin of the Scenery of the Lake District.—At a recent meeting of the Geological Society, Mr. R. D. Oldham, of the Indian Geological Survey, read a paper on the origin of the Dunmail Raise. Its form, he says, is that of an old river-valley, now occupied by much smaller streams than that which formed it. Such a gap cannot have been formed by recession of watersheds or capture through erosion; for in either case the stream on one side or the other of the watershed must necessarily fit its valley, while in the Dunmail Raise there is a misfit on both sides. The gap was in existence before the Glacial period, and consequently cannot have been formed by ice; and so by a process of exclusion the explanation is arrived at that the gap of the Dunmail Raise was formed by a river which flowed across the hills from north to south, and cut down its channel *pari passu* with the

elevation of the hills. The final victory of upheaval over erosion, whereby this river was divided into two separate drainage-systems, and the barrier of the Dunmail Raise upheaved, may have synchronized with a diversion of the head-waters and a consequent diminution of volume and erosive power. It was pointed out that this explanation comes into conflict with previously published theories of the origin of the drainage-system of the Lake District as radiating from the centre of a dome-like upheaval. The existence of a large river crossing the area of upheaval and maintaining its character of an antecedent river-valley for a long period, shows that the surface was originally a peneplain of sub-aerial denudation, and not a plain of marine sedimentation or erosion. From this it follows that the course of the main drainage-valleys may not have been determined by the original uplift, but by the cutting-back by erosion into the rising mass of high ground—in other words, that the principal valleys of the Lake District may be subsequent, not consequent, in origin.

Geomorphological Investigations in the High Alps.*—The work of Prof. Richter is mainly concerned with the corries, amphitheatres, and trough-like valleys of the Alps. The origin of corries (*Welsh*, cwms; *Fr.*, oules; *Ger.*, Kahre or Kare) has given rise to much discussion, some of which, perhaps, is due to calling different forms by the same name. For Prof. Richter a corrie is a rounded niche in a mountain-side, with angular walls and ice-polished sills, and can be formed only in a climatic zone where there is no flowing water, but where its place is taken by slowly moving snow or ice, while the bare rock is exposed to many temperature changes near the freezing-point. They are to be distinguished from the similar but not homologous forms in the mountains of desert regions, where the wind removes the rock-waste falling from the steep sides of the niche, and from the amphitheatres in horizontal sandstones caused by water-erosion, such as those in Saxon Switzerland. The true corrie originating above the snow-line, distinguishable by its roughly weathered sides, may be distinguished as active, where the glacier still covers the bed, and inactive, where the polished surface is ice-free. If only a line of "active" corries is found in a mountain region, the present may be considered the minimum snow-line. If "inactive" corries occur, they reveal the limit of a former snow-line; and with the addition of the morainic deposits help us to picture the past glacial development. The difficulties of interpretation in the case of mountains with existing glaciers are numerous. Corries rarely occur where the slope is over 31°, and are not found in the deeper regions of the interior of higher groups. The alpine forms above the snow-line of the ice age are due to ice. Long ranges have the sharp forms common to most lofty mountains, with corries and sharp ridges between, although the glaciers have vanished, or were much more important. Much waste has been removed from the corries, and at the corrie-line is a denudation surface, which is well marked in the Eastern Alps, which were not strongly glaciated in the ice age. Here the snow-line was between 1600 and 1800 metres, which, when compared with the values for the Tuscan Apennines and Balkan peninsula, show that a marked extreme (so-called "continental") climate existed in the Eastern Alps, while in the Mediterranean region marine influences raised the level of the snow-line.

The Lakes of the Karst.—All the most important lakes of the Karst region of Austria-Hungary have lately been the subject of detailed exploration by Dr A. Gavazzi, who will shortly publish the results in the *Abhandlungen* of the Vienna Geographical Society. The first section will deal with the lakes from a

* "Geomorphologische Untersuchungen in den Hochalpen." Von Dr. E. Richter. *Petermanns Mitteilungen*, No. 132. Gotha, 1900.

morphological and statistical point of view, and we are enabled, through the author's courtesy, to here record the principal facts brought out by his researches. Dr. Gavazzi divides the Karst lakes into perennial and periodic lakes, again subdividing the first category into fresh-water, brackish, and salt-water lakes, the second according as they communicate with the sea above or below ground. The following table gives the principal *data* for the perennial lakes, the arrangement within the separate groups being according to the volumetric measurement of the basins:—

	Origin and class.	Altitude (feet).	Area (square miles).	Depth (feet).		Volume (millions of cubic feet).	Mean slope.
				Max.	Mean.		
							°
Fresh-water lakes—							
Vrana (Cherso island)	Rift-polje; crypto-derpession *	*c.* 46	2·15	276	128·9	7704·5	5·5
Vrana (Dalmatia) ...	Anticlinal polje; Crypto-depression	2	11·58	13	6·9	2230·0	0·2
Bačine „ ...	Crypto-depression	14	0·85	104	37·7	895·5	6·5
Kozjak (Croatia) ...	—	*c.* 1758	0·31	162	56·7	475·5	16·5
Proložak (Dalmatia)	Polje	843	1·25	135	10·8	375·1	1·5†
Prožće (Croatia) ...	—	*c.* 2077	0·24	132	43·3	295·0	14·0†
Čepić (Istria) ...	—	79	3·16	8‡	3·0	263·6	0·1
Njivice (Veglia island)	Anticlinal crypto-depression	*c.* 16	0·29	32	11·5	90·4	1·5†
Doberbob (Görz) ...	Anticlinal erosion hollow	*c.* 33	0·14	30	1·6	6·7	0·3
Blindinjer (Bosnia) ...	—	3878	1·29	—	—	—	—
Brackish lakes—							
Blato (Meleda island)	—	—	0·03	—	—	—	—
Blatina „	—	—	0·02	—	—	—	—
Salt-water lakes—							
Novigrad (near Zara, Karin Dalmatia)	Remnant of Upper Eocene basin	0	11·06	125	60·7	18730·1	1·3
		0	2·11	51	27·9	1640·8	1·2
Prokljan (river Krka, Dalmatia)... ...	Subsidence ...	0	4·28	79	30·2	3621·7	1·3
Vlasko (Narenta river, Dalmatia)	—	0	0·16	46	20·3	89·3	4·0
Kuti, or Gjuvelek	—	0	0·57	15	4·3	78·2	0·5†
Desno jezero	—	0	0·34	8	2·6	23·4	0·5†
Modrosko	—	0	0·01	60	—	—	—
Muravnjak (Lunga island)	—	0	0·09	19	9·3	23·7	2·2

The greater number of the lake-basins slope in concave curves to the deepest point, those in which the slope is convex, giving a volume less than that of a hollow cone of the same surface area and depth, being distinguished in the table (last column) by an obelisk. Of periodic lakes and periodically-filled "poljes," the following, in addition to the well-known Zirknitzer See, were among others examined by Dr. Gavazzi: Kukuljanovo, Dabaz, and Svica, in Croatia; Nadin, Bokanjac, Plina, Jezerce, and Rastok, in Dalmatia; Busko Blato, in Bosnia.

The Lakes of the Reschen-Scheideck.—Of the passes crossing the region between the basins of the Inn and the Adriatic, two, the Maloja and the Reschen-Scheideck, are remarkable for a number of lakes. In the former case the lakes lie

* *I.e.* a lake in which the bottom is below sea-level. † Convex curve.

‡ 28 feet in a "ponor."

north of the watershed, at the sources of the Inn; and in the latter south of it, at the sources of the Adige. Ascending the Stillebach from the Inn at Finstermünz, the watershed is crossed at an elevation of 1510 metres, and a wide gently sloping valley is entered, close to a small stream called the "source of the Adige." In this stretch of valley, 23 miles long, with a fall of 2526 feet, are three lakes, the Reschensee (elevation 4848 feet), the Mittersee (4835 feet), and the Haidersee (4753 feet). The region is obviously one of peculiar interest, not only locally, but in the history of the Alps generally, and an exhaustive examination of it and of the lakes has accordingly been made by Prof. D. Müllner, whose results are published in the first number of the seventh volume of Prof. Penck's 'Geographische Abhandlungen.' Prof. Müllner first describes the positions of the lakes and their surroundings, and discusses the probable origin of the lakes themselves and of the peculiar region they occupy. Next he gives an estimate of the area draining each lake, and a minute study of their areas and depths; then a study of the levels of the water surfaces and their variations, and of their precise relation to the rainfall over the catchment area; and finally an account of the freezing of the lakes, with an estimate of the quantities of heat absorbed and set free by the formation and melting of ice.

ASIA.

New Administrative Division in North-West India.—A step which has been meditated for some time, and of which the need was specially demonstrated at the time of the last North-West Frontier war, has been taken by Lord Curzon in the formation of a new administrative area on that frontier. Although it has been spoken of as a "province," this is not strictly correct, as it is to be administered in the same way as Baluchistan, which is an "agency" administered, not by a lieut.-governor, but by a political officer directly responsible to the Viceroy. As in Baluchistan there is British territory administered by a civil staff drawn from the Indian Civil Service, and native territory merely under political supervision like any other native state in India, so in the new agency there will, it seems, be both British and native districts. The former, which have hitherto formed the Trans-Indus portion of the Punjab, making up about a fifteenth part of its administrative area, are included, geographically, in the Hazarajat, Peshawur valley, and the Derajat down to the Baluch frontier. They will probably continue to be administered by the present civil staff. The independent districts lying beyond the borders of British India proper, and between it and Afghanistan, are those of Swat, Mohmand, Afridi, Tuvi, Dawari, Waziristan, etc., which may be summarized as the Pathan tribes of the borderland up to the Kashmir frontier, together with the non-Pathan district of Chitral. As the frontier force is now directly under the command of the commander-in-chief, it seems quite in accordance with the fitness of things that the administration of the frontier should be, as it will, directly in the hands of the viceroy. Strategically, the position on the Pathan border will still be different from that in Baluchistan, as the advance posts are not connected by lines of occupation such as would dominate and enclose the independent tribes between them and the British border, who have always a retreat into Afghanistan open to them in case of need. On the Baluch frontier they are so enclosed.

Kozloff's Expedition to the Gobi.—The early stages of this expedition were described in the *Journal* for January, 1900 (p. 56), while the receipt in Russia of further news was subsequently recorded. M. Kozloff and his companions have now finished their work, an outline of which, from letters published in the *Izvestia* of the Russian Geographical Society, is given by M. Deniker in the first number of *La Géographie* for the present year. M. Kozloff left Kobdo in August, 1899, for the exploration of the Mongolian Altai, following the valley between the

northern and southern ranges, which at first were composed of pink and grey granite, denuded by atmospheric agencies. Passing the Khulmu-nor, he reached Lake Begher, situated between the low northern range and the high *massifs* of Khara-Atzarga and Burkhan Buda in the south. Both chains are covered up to about 6000 feet with thick forest. Mysterious sounds, which had been spoken of by the natives as emanating from these mountains, were found to be due to the meeting of the warm current of air from the plain with the cold air of the mountains. Near Kharghin Tsagan-nor patches of "sulkhir" (*Agriophyllum gobicum*) were noticed, the seeds of which, as was found to be the case in Alashan by Prjevalsky, were eaten by the Mongols. The southern chain (known as Altain-Nuru) terminates east of the Burkhan Buda, near the fresh-water lake Khuduk-nor. The route from Uliassutai to Yu-men-hsien, near Suchau, passes to the east of the lake. After a stay in this neighbourhood MM. Kozloff and Ladyghin proceeded to Orok-nor, at the foot of the northern chain (here formed by the great and little Bogdo), and, passing the Artsa Bogdo, which marks the point at which the range bends to the south-east, reached the well of Chatseringhi-Khuduk, south-west of Ulan-nor, which is placed some 60 miles too far east by Pievtsof. The well lies opposite the huge triple mass of Gurban-Saikhan. Here Kozloff met Koznakoff, who had explored the southern versant of the Altain-Nuru—barren slopes cut by numerous gullies, prolonged as ravines in the plain. This is the abode of the *Antilope gutturosa* and of an animal named "taka," which is probably the *Equus Prjevalskii*. Some half-nomad Mongols were met with on the Bijen-gol, which serves to water their fields, and supports a fairly abundant vegetation. Further east the desert reappears, and is dominated in the north by the Ike Tain, a portion of the Altain-Nuru, and stretches south to the chain of Aji-Bogdo, some of the peaks of which were covered with snow in October. Whether or not this belongs to the Altai system seems doubtful. Koznakoff afterwards crossed over to the northern chain, passing the monastery of Yum-Beisin, the residence of a "Khubilgan" or Buddhist incarnation, and finally reaching the well of Sairen on Prjevalsky's itinerary between Urga and Alashan. In this part of Mongolia the administration of the districts is in the hands of ecclesiastics, chosen, like the Khubilgans generally, from secret indications on the part of the higher clergy. The second part of the work of the expedition consisted of the survey of three separate routes across the least-known part of the Gobi. M. Kozloff chose the most easterly route, which led a little east of the meridian of Liang-chau. Crossing the Kuko-Morito range and the depression of Goitso, he reached the desert proper, sparingly covered with sand, forming dunes or "barkhans" running east-south-east. Their northern slope is gently inclined, but the southern steep. Between these there are small oases, where fresh water is found at a depth of 6 feet. Beyond the small fresh-water lake of Kuku-burdu the range of Yabarai, where an apparently new species of *Ovis* was met with, was crossed by a pass of 5400 feet, the route then leading by Sokho-khoto, or Chen-Fan, to Liang-chau. The route taken by Koznakoff led by the lakes Sokho and Gashun-nor and the valley of the Edzin-gol, which were for the first time accurately surveyed. Ladyghin crossed still further west, across the most broken part of the desert. The Tumurten range was found to be well watered, wooded, and abounding in game, recalling, in fact, the Mongolian Altai. This route debouched on Su-chau.

AFRICA.

The North-East Shores of the Victoria Nyanza.—Sir Harry Johnston has communicated to us the decisions recently arrived at by the Uganda authorities as to the nomenclature of various bays and other features on the north-east shores of the Victoria Nyanza. Considerable modifications have been introduced into the

map of this part of the lake by recent surveys, especially those of Commander Whitehouse, of the railway survey, but, until more details are received, it is not easy to grasp the exact character of the discoveries. The bay hitherto known as Ugowe bay will in future be called Kavirondo bay, as the former name is unknown on its shores. It will, Sir H. Johnston says, be applied to "the real Ugowe bay, which is the large shallow inlet to the north of Kavirondo bay, discovered by Stanley in the first instance," but lately rediscovered by Commander Whitehouse. This officer has found that the large island at the mouth of Kavirondo bay is really two islands, and that this bay possesses additional gulfs of its own towards the south. He has also discovered a number of new islands in the northern waters of the lake. Other points of nomenclature are—the tiny inlet at the north-east corner of Ugowe bay will be known as Railway inlet; the projected railway terminus at the corner of this inlet will be called Port Florence, from Mrs. Whitehouse, the wife of the chief engineer; and the adjoining Government station to the north, Kisumu. A steamer belonging to the Uganda Government, the *William Mackinnon*, has at last been launched on the lake, across which she made her first trip in November last. The steamer was built in Glasgow at the instance of the late Sir W. Mackinnon, but was taken over by the Government on the declaration of the Uganda Protectorate. One or two points in the above are not quite clear. By the large island at the mouth of Kavirondo bay, it would seem that Ugingo is intended, so that the name Kavirondo bay would apply to the whole stretch from this island to the most easterly point of the lake. This leaves very little room for an independent bay before Berkeley bay is reached. Stanley, moreover, showed no decided bay, but only a gentle curvature of the coast, between his "Nakidimo creek" (in 0° 20′ S.) and Berkeley bay (his "Bay of Manyara"), while the name Ugowe was heard by him south, and not north, of Nakidimo creek, which was evidently some portion of the present Kavirondo bay.

The Name Kenya.—We are informed by Mr. Mackinder that the name Kenya, as to the origin of which a considerable amount of discussion has been held, has lately been found by Captain Hinde to be in actual use among the Wakamba of the Kitui hills, the very district from which Krapf first obtained a view of the mountain fifty years ago, so that the accuracy of that traveller is satisfactorily established. It is curious, as Mr. Mackinder remarks, that a name of such local usage should have become attached to the mountain. It is also somewhat strange that among the names recorded by Krapf, who, while at Kivoi's village in Kitui, made inquiries as to the geography of the countries north, of representatives of various tribes, including people of Kikuyu and north and north-west Ukambani, we do not find either the Kikuyu name Kilinyaga or that of the Wakamba, Njalo (both given by Gregory). The full form was, according to Krapf, Kima ja Kegnia (Mount of Whiteness), others in use being Kirenia and Ndur Kegnia. The traveller also mentioned the Masai (Wakwafi) name Doenyo Ebor under the form Orldoinio Eibor (White mountain). Dr. Kolb, who twice passed through Kitui on the way to the mountain, does not say whether he found the name Kenya in use. He speaks of the central peak as Kilimara, apparently a variant of Kilinyaga.

Exploration of the Southern Shari Basin.—News has lately been received in France of the safe return to Brazzaville of the expedition to the south-west portion of the Shari basin, the organization of which, under MM. Huot and Bernard, was announced in the *Journal* for September last. The expedition seems to have been very successful, and has added materially to our knowledge of the southern Shari basin and adjoining parts of that of the Congo. The February number of the *Bulletin* of the *Comité de l'Afrique Française* contains the account,

with sketch-map, of a preliminary journey by M. Bernard to the basin of the Wom, or Wa, the stream first made known by M. Clozel, which has generally been taken to be a branch of the Logone, though M. Wauters suggested that it might belong to the system of the Ubangi. Starting from the Gribingi station, M. Bernard struck west, and reached various streams flowing north which unite to form the Fafa river. He finally reached a large river called Wa, which had a width of over 200 yards. The country near its banks was inhabited by the Dagbas, who possess short heavy canoes similar to those in use on the Shari. Embarking on the stream, the traveller followed its course to the north-east, as far as a point, in about 7½° N., 18½° E., where it suddenly bends to the north-west. This point was far to the east of the course usually assigned to the Wom, as to the identity of which with the Wa there could, however, be little doubt. M. Bernard therefore came to the conclusion that it must be identical with the Bahr Sara, mentioned by Maistre as one of the three principal branches of the Shari, and even regards it as the main headstream of the latter river. He afterwards traced the river upwards to about 6° 45′ N., in which latitude he was only about 50 miles north of the lowest point on the Wom reached by Perdrizet. The river retained a width of 150 to 200 yards, with a winding and rocky course. It was said to come from a long distance towards the west, and one of the tribes inhabiting its banks in this direction was said to obtain beads from Europeans. The latest news states that the expedition has since surveyed the middle course of the Wom, proving its identity with the Bahr Sara, and afterwards surveying the mountainous zone which separates the basins of the Congo and Shari. The return journey was made in part by the Bali, probably the upper course of the "Likuala aux Herbes," from which the travellers crossed over to the upper Sanga.

Exploration in the Ivory Coast Hinterland.—The first number of *La Géographie* for the present year contains an account of the geographical work done by the expedition of Captain Woelffel, who, with Lieut. Mangin, started from the Sudan for the Ivory Coast at about the time when the Hostains-d'Ollone mission set out in the opposite direction. Captain Woelffel explored a district east of that traversed by Hostains, lying on the headstreams of the Sassandra river, the principal stream of the western portion of the Ivory Coast. Leaving Sigiri on the upper Niger on February 18, 1899, the expedition crossed first the Tankisso, and afterwards the Niger at a point where its width was nearly 2000 yards. Passing Kankan, an important Mussulman centre, it reached Bissandugu, once the capital of Samory, but now sunk to a village of 100 to 150 inhabitants. At Beila, on the water-parting between the Niger and the coast rivers, the final preparations were made, and on resuming its march the expedition passed through Boola—an important market where the Diulas of the Sudan exchange their salt and cloth for the kola nuts brought from the south by the Gerzes—and, crossing the difficult pass of Zaragwe, reached the large Gerze-Manon village of Lola, on the borders of the Guinea forest-zone. Hence expeditions were made to the south-east, to the headwaters of the Diugu, or Kavalli, and Zo, but much difficulty was experienced from the hostility of the natives, by whom constant attacks were made on the party. The return was finally effected by a northerly route across the Bafing and Fereduguba. The length of the new routes surveyed amounted to over 900 miles, and linguistic, photographic, and botanical work was also done. The country presents a great interest geographically, being formed of a series of mountain *massifs*, whence streams descend in all directions, fed by the winter rains, which last more than seven months in the year. In the north (about 8¼° N.) the Geye range separates the Niger basin from that of the Fereduguba. In the west it splits up into two chains, which, with others radiating from a mountain-knot in about 8° 10′ N.,

8½° W., separate the upper courses of the various coast streams. A little further south the *massifs* of Naba and Kore, the former an enormous block of granite and sandstone, rise to a height of over 7000 feet. Their upper parts are bare and steep, all the surface soil having been washed down to the valleys. East of these the broad upland of Zelekuna, which probably reaches 10,000 feet, is clothed with dense forest, which with the broken nature of its surface, renders it almost impassable. A long chain forms its continuation in the direction of the Fereduguba. The identity of this river (which receives on the left the Tienba, and on the right the Bafing) with the Sassandra, first suggested by Blondiaux, has not yet been demonstrated, but there can be little doubt as to the fact. The next river to the west, the Zo, is said to have a general south-easterly direction, and would seem to belong also to the basin of the Sassandra. In 6° 45′ N. it is over 100 yards wide, and carries a large volume of water in the rains. The Diugu, which rises between the *massifs* of Naba and Kore, was considered by Hostains as the headstream of the Kavalli, but Captain Woelffel is inclined to think the Mani, which rises further west, the larger branch. The limit of the dense forest seems to run from west-north-west to east-south-east, between 7° and 8° N. It abounds in wild animals, but domestic animals become more and more scarce as one proceeds south. The inhabitants are agile and well made, and of a medium height. Their colour is rather bronze than black. Though all of the same race, they speak a variety of languages.

New Capital of the Ivory Coast.—On November 23 last the capital of the French Ivory Coast was transferred from Grand Bassam to Ajame, the step being mainly due to hygienic considerations. The new capital will in future be known as Bingerville, after the explorer who did so much to open up the *Hinterland* of the colony.

Egyptian Public Works in 1899.—The report for 1899 by Sir W. E. Garstin, on the administration of the Egyptian Public Works Department, contains a large amount of information on all matters connected with the irrigation branch of the service. The flood-supply of the Nile was in 1899, it will be remembered, the worst on record, and though from January till June the levels at Aswan were above the mean of previous years, the maximum (on September 4) was 1·23 metre (4 feet) below the average of former years. After September 4 the river fell very rapidly, and at the end of the year the level was 1·75 metre (5·74 feet) below the average. The lowest floods recorded at Aswan were those of 1877 and 1888, so that the flood of 1899 carried on for the second time the sequence of an eleven-year period. Thanks to the careful regulation of the supply, and especially to work done by the barrage, fully made use of for the first time in its history, the loss of crops was surprisingly small. That of cotton was nearly a record one, and the out-turn of sugar-cane and maize was on the whole good. The rice crop was both good and exceptionally large. For the forecast of the flood the river-gauges at various points in the Sudan proved of much value, and interesting results have been obtained as to the time taken by the flood-water to travel from one point to another. Good progress was made during the year with the new weirs below the *barrage*, with the drainage system of Lower Egypt, and with the works connected with the reclamation of the Wadi Tumilat. In connection with navigation, the chief work was the construction of the Saneta lock on the Mansurieh canal. Borings for water at Medinet El Fayum and Beni Suef were unsuccessful, although at the former the borings were carried 205·7 metres (674 feet) below the surface, or 182·3 metres (598 feet) below mean sea-level. During the year an excellent start with the works for the great Nile reservoirs was made, and at Aswan 97,670 cubic yards of masonry was completed in the

solid portion of the dam, which for a length of 400 yards was brought to within 6½ feet of its full height. The excavation for the foundations was in all cases carried down to the solid rock, this necessitating an unlooked-for amount of work, as the rock underlying the surface-granite consisted largely of decomposed schists with seams of clay. An important work was the closing of three out of five of the deep channels which traverse the line of the work, by temporary dams or "sadds." Equally good progress was made with the weir at Assiut. A special section of the report deals with the work of the Survey department. In the Fayum, to which work had been transferred from Gharbieh, the major triangulation was completed and about two-thirds of the minor triangulation observed. The base-measuring apparatus had been sent to Paris for re-engraving, etc., and was to be compared with the international standards at Sèvres. For the Geological Survey two parties were working in the Sinai peninsula, two in the Fayum and Nile valley. The work in Sinai brought to light many interesting facts in relation to the earth-movements to which the peninsula owes its origin; while the Nile valley between Aswan and Korosko was mapped in detail on the scale of 1 : 10,000, and a detailed geological survey of the first cataract completed. In the meteorological department arrangements were made for the commencement of systematic observations in 1900, and for the transmission of automatic time signals to the central telegraph station in Cairo, and thence to Port Said, Alexandria, and Suez. The observatory is now in charge of Captain Lyons, the head of the Survey department.

Mr. Weatherley in the Upper Congo Basin.—In a letter to Mr. Alfred Sharpe, dated "Chita, Lake Mweru, September 8, 1900," Mr. Weatherley sketches his plans for an expedition west into the Congo State territory. He proposed to start in a couple of weeks for the Kalumengongo river—such, he says, is the true name of the Lufira—on a visit to the Congo rebels' camp. From the accounts given by an Austrian trader, he considers the Kalumengongo to be a larger stream than the Luapula, and navigable for long distances. Being an Englishman, Mr. Weatherley hoped to get through the rebel country, though most of the Belgian officers are reported to have been killed and some eaten—the fate of all prisoners of war. The most important chief among the rebels is one Yamba Yamba. Before starting on his journey, Mr. Weatherley intended visiting Chienye to view the launch of a small steam-vessel, the first to make its appearance on Lake Mweru.

AUSTRALASIA AND OCEANIC ISLANDS.

Glacial Phenomena in Australia.—Prof. Penck has added another to the lengthening list of classical examples of geomorphological research from his pen, in a paper on the glaciations of Australia, published in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*. Dealing first with the phenomena ascribed to the action of ice during Permo-carboniferous times, the deposits found in different localities in South Australia, Victoria, Queensland, New South Wales, and Tasmania, and the similar deposits occurring in India and South Africa, are described in detail. Assuming a common glacial origin for the deposits, the hypothesis of an ice-cap surrounding a south pole situated in about lat. 23½° S., long. 85° E., is examined, and it is shown that, even supposing the difficulty of explaining such a shifting of the Earth's axis to be got over, it not only fails to find a counterpart in the northern hemisphere or in the changed position of the equator, but it does not satisfy the apparent direction of movement of the southern ice, as deduced from the position and structure of the deposits. Prof. Penck accordingly concludes that either our knowledge of the facts is as yet altogether inadequate, or that some important element has been overlooked, and in reviewing possible lines of further research he fastens upon certain points of peculiar significance. First, the Gondwána beds,

which are closely associated with each of the supposed glacial deposits in Australia, India, and South Africa, are so similar that their flora has been assumed to have spread from a sunken continent in the Indian ocean, but they have recently been identified by Bodenbender in the Argentine Republic—a discovery which does away with the sunken continent, and merely requires connection of each of the present continents with the land of the antarctic. From the nature of certain conglomerates described by Bodenbender, it is surmised that the glacial deposits may also be discovered in South America. Reverting next to the deposits themselves, Prof. Penck draws attention to two features which occur in all three localities. Unlike ordinary boulder-clay, the matrix constantly exhibits a bedded structure, and the boulders and pebbles included in it are scored and *facetted* in an unusual way. Minute comparison shows considerable resemblance to the "pseudo-glacial" phenomena observed in the Nagelfluh, and again—as another example—at Kaltenleutgeben, close to Vienna. While it is scarcely possible to suppose that the deposits are of other than glacial origin, it is essential that each should be carefully examined *in situ* to determine how far it has been modified by other agencies, and especially by pressure. In the second part of his paper, Prof. Penck treats of the Quaternary ice-age of Australia and New Zealand: the evidences of ice-action in New Zealand, Tasmania, and the Australian Alps of New South Wales and Victoria are examined separately with the special purposes of estimating the position of the snow-line, and of ascertaining how far the record is of a real glacial period comparable to that of Europe, or merely of somewhat extended glacier distribution. Comparing the result with the western Pyrenees and the Sierra da Estrella, a region antipodal and exposed to similar climatic conditions, the elevations of the snow-line at the period of maximum glacial action are found to be—

Lat. 43°: Western Pyrenees, 4250 feet; New Zealand Alps, under 3250 feet; difference over 1000 feet.

Lat. 40°–42°: Sierra Segundera—Sierra da Estrella, 4450–4600 feet; Tasmania, under 2950 feet; difference over 1500–1650 feet.

At the present day the snow-line ranges in the Iberian peninsula between 2500 metres and 3100 to 3200 metres, and in New Zealand and Australia between 1800 and 2900 metres, hence the mean change since glacial times, about 1200 metres, is the same in both cases. There is, further, evidence to show that the glacial conditions of Australia and the neighbouring islands bore a relation to the present climate closely resembling in many of its aspects the relation of the climate of the glacial period to that of the present day in Western Europe. The results suggest that the ice-age occurred in both these widely separated regions at the same time, and that it was due to a lowering of the snow-line produced by a common cause, merely superposed on the present climatic *régime*; an hypothesis which, though not yet established, has at least received no contradiction from present research.

Canoe Voyages in the Pacific.—Some striking instances of extended canoe voyages by inhabitants of the Pacific islands are recorded in the *Deutsches Kolonialblatt* for January 15. The voyages were not strictly involuntary, and therefore have no direct bearing on the question of the original peopling of the Polynesian groups, but they are none the less of interest as illustrating the capacity possessed by the islanders of traversing long distances in their frail vessels without any of the scientific aids possessed by civilized navigators. The story comes from Yap, but relates to natives of Ugoi, who, after the typhoon of November, 1898, set out for Fais (east of Yap) in search of a fleet of canoes which had been dispersed by the tempest. Unable to reach their destination, and meeting with no better success in the endeavour to make Yap or the Palaus, they finally sailed west, until

they reached an island named Kiuvan,* in the central portion of the Philippine group. Seven canoes, with a total crew of thirty, eventually made their way to this island, including one which had left Ugoi shortly before the rest. After waiting in vain for the setting in of the west wind, they took in supplies of cocoanuts and water and set sail, but after beating about for thirty days still saw no sign of land. Uncertain what course to take, they parted company, some trying for the Palaus, others for the Ngoli or Matelotas group, and one for Yap, which was reached nineteen days later, after a voyage, in all, of 2000 nautical miles. Four others subsequently joined the first at Yap, having gained the Matelotas two and a half months after leaving Kiuvan. In answer to inquiries as to the means employed for steering a course in these watery wastes, it was stated that each canoe contained navigators specially trained from boyhood to steer by the stars. The return voyage is of special interest, from the fact that it was against the prevailing current, and that, probably on this account, the Spaniards were long unsuccessful in their attempts to discover the Palaus from the Philippines.

POLAR REGIONS.

The Polar Wolf and Musk-ox in East Greenland.—Dr. Nathorst contributes to the first number of *La Géographie* for the current year a paper on the present and past distribution in Arctic America of the polar wolf and musk-ox. The first of these animals (a variety of *Canis lupus occidentalis*) has, he says, reached the coasts of East Greenland, where its presence was indisputably proved by him in 1899, within quite recent years. In West Greenland, where reports of an animal called *amarok* by the Eskimo have long been current, the existence of the wolf has been also established within recent years, but it still only occurs accidentally on that side. The route by which it has made its way to East Greenland can be traced by the mention of the animal in the narratives of voyages. It has been seen, *e.g.*, on both sides of Robeson channel, by the *Polaris* expedition in 1872, the Nares expedition in 1876, and by Greely in 1881–83. On the north-east coast of Greenland its presence was ascertained both by Astrup and Peary (1892–94) on the shore of Independence bay, so it is evident that it has migrated from the American archipelago across North Greenland and down the east coast. As no traces of wolves had been seen on the latter coast down to the date of Ryder's expedition, which wintered in Scoresby sound in 1891–92, Dr. Nathorst concludes that its arrival there was subsequent to 1892. Already some modification of the fauna seems to have resulted from its presence, especially in the direction of a diminution in the numbers of reindeer, which, though formerly plentiful, were seen in 1899 in comparatively small numbers only. The blue fox seems also to have become less abundant. The musk-ox, so widely distributed in the north in former geologic times, but now limited to a comparatively restricted area in northern North America (shown by Dr. Nathorst in a sketch-map), seems also to have arrived in East Greenland (in modern times) at a comparatively recent date. No remains of the animal are to be found in the "kitchen-middens" dating from the occupation of the country by Eskimo, nor were any specimens seen by explorers in the early part of the century, being first noticed by the German expedition in 1869. The musk-ox must, however, have existed in East Greenland at a very remote period, for single skulls, bearing evidences of great age, have been picked up at two different points on the coast. Dr. Nathorst concludes by pointing out the advantages which might be derived from the domestication of the musk-ox, of

* This seems to be the same name as Guivan, on the island of Samar, a place to which two canoes from the Palau group are said to have been driven in 1696 (see *Pet. Mitt.*, 1890, p. 162).

which a fair number of specimens are now in Europe. Only those in Sweden, however (lately brought back by MM. Kolthoff and Næso), which number in all two males and three females, have an environment similar to that of their natural habitat.

GENERAL.

Influence of the Vegetation of a Country on its Rivers.—A valuable paper on this subject, though itself merely an outline of a more detailed discussion by the same author in the *Vierteljahreschrift des Bayerischen Landwirtschaftsrathes*, appears in the November number of the *Meteorologische Zeitschrift*, from the pen of Prof. E. Wollney, of Munich. The writer begins by pointing out the incompleteness of the methods of inquiry usually followed in reference to the part played by the plant-growth of a country in determining the amount of water carried off by rivers, holding that the true method of approaching the subject is an inductive one, in which the working of each individual factor is separately studied in order to arrive at the combined result. The practical importance of the question is shown by the obvious advantages which arise from the equalization of the flow of rivers—that is, the lowering of the flood-level and the raising of the low-water mark—the latter of which follows as a natural consequence from the former. Unlike many writers, Prof. Wollney does not limit himself to the consideration of forests as a factor in the question, but includes vegetation of all kinds. He traces the influence of a plant-covering on (*a*) the moisture contained in the soil; (*b*) the amount of water carried away both above and below the surface; (*c*) the rate at which such water is carried away; (*d*) the maintenance of the supply of the rivers. Under this last head he shows that, though a plant-covering might seem at first sight to lower the level both at high and low water, and so fail to produce the required equalization, this is not so in fact, owing to the retention of the water in the soil by plant agency. The second section of the paper deals with the influence of vegetation on the solid matter transported by running water. In this respect forest exercises the greatest effect in reducing the amount of material removed, grass somewhat less, and cultivated crops the least. The general conclusions to be arrived at are three. In the first place, rivers receive a diminished water-supply from areas covered with vegetation, both by reason of the accumulation of the water in the soil beneath the plants, and of the strong transpiration of the latter. Secondly, the rapidity of flow of the water both above and below the surface is lessened by the obstruction offered by the plants and their roots; and, thirdly, the removal of earth from sloping ground is retarded in an extraordinary degree by the compacting influence of vegetation. The measure of the most practical importance for the equalization of the flow of streams in the interest of agriculture, is the preservation of a covering of perennial vegetation in the source region of the rivers. On level ground such a covering is of less importance, except where the soil is so porous as to permit an extensive lateral movement of the water.

The Oxford School of Geography.—The recently issued report for 1900 on the Oxford School of Geography, contains some encouraging features, while at the same time pointing to the need of continued exertions on the part of those interested in the improvement of geographical education in this country before the goal so much to be desired can be considered reached. As regards attendance at the lectures, two points are to be especially noticed. In the first place, while during the Hilary and Michaelmas terms the numbers reached ninety-five and one hundred respectively, in the Easter term they fell to sixteen, showing that comparatively few students are sufficiently in earnest to withstand the various counter-attractions of the summer term. Secondly, of the total attendance in the other two terms, a preponderating proportion (89 and 93 per cent. respectively)

attended one, or at the most two, courses of lectures only, and these entirely on the general or historical sides of the subject. The number of those making a special study of geography as a subject in itself is, therefore, still extremely limited—six, four, and five being the respective numbers of those who availed themselves of all the instruction offered, including the important section of practical work in the laboratory or in the field. The list of lectures and other instruction given during the year shows that little is to be desired on the score of efficiency and comprehensiveness of the teaching, and it is only to be hoped that in course of time many more will avail themselves of the valuable facilities placed at their disposal. The year under review being the first in which such effective teaching, with apparatus, was offered, it was not to be expected that all the wished-for results could be immediately attained. The institution of the University Diploma in Geography, candidates for which must have attended a prescribed course of lectures and study at the school, and for which the first examination will be held in June next, will no doubt exercise a beneficial influence in the future. Inquiries addressed to a considerable number of public schools, with a view to ascertaining whether holders of the diploma would be welcomed as teachers, elicited favourable replies from thirty-two public schools for boys, and from twenty-seven high schools for girls. The syllabus issued shows that the standard required will be sufficiently high to give the diploma a real value, candidates being expected to answer papers on general physical and regional geography, as well as on three of a group of more special subjects, such as geomorphology, the history of geography, military geography, etc. As regards equipment, the staff are evidently still at a disadvantage, for although the sum of £120 has been expended in the purchase of the most urgently needed apparatus, this must be quite inadequate to meet the requirements of a thoroughly well-equipped school.

The Geographical Association.—The annual meeting of the Association was held in the hall of the College of Preceptors on January 9, the chair being taken by the President, Mr. Douglas W. Freshfield. The report, read by Dr. A. J. Herbertson, Honorary Secretary, shows that during the year eight members retired and thirty-seven joined the Association, which is now represented in eighty-four schools. Although, by a resolution carried at the last annual meeting, the Association is now open to all teachers in geography, as yet no elementary school teachers have joined it. A branch has been formed in the city of Melbourne. During 1900 a new catalogue of lantern slides was prepared, and arrangements were made with the Diagram Company for lending the Association's as well as the Company's slides to members for a very small charge. A successful discussion on the teaching of geography was organized at the Cambridge summer meeting. The desirability of starting a journal in connection with the Association having been suggested to the Committee, it has been decided to issue one or two experimental numbers in 1901, provided a sufficient guarantee fund can be raised. Such a journal would discuss the methods of teaching geography, and bring to the notice of teachers the most reliable and valuable information on geographical topics of educational importance. After the reading of the report, the office-bearers were re-elected, with the addition of Mr. A. D. Carlisle, of Haileybury, who replaced the late Mr. Harrison of Fettes. Dr. Mill's resignation was intimated with great regret, and he was made an honorary member. The President then showed a series of slides illustrating his recent journey in the Himalaya of Sikhim and Nepal, and bringing out in a striking way the great contrasts of scenery which can be observed within a short distance, as the altitude varies from 700 to 28,000 feet. The journey has already been described in the *Journal* (vol. xv. p. 642). Mr. T. G. Rooper, H.M. Inspector of Schools, then delivered an address on "Practical Geography,"

which was illustrated by specimens of practical work done in schools and on excursions and by a number of wall maps. He pointed out that while the British had done good work as explorers and traders all over the world, they had done little or nothing to advance the study of theoretical geography. The old tradition of catalogues of names, useful perhaps in the sorting department of the Post Office, but otherwise dull and uninteresting and of no educational value, was still too much followed. He then outlined different methods of teaching geography. A full report of his paper will shortly be published by the Geographical Association.

Scientific Expedition to Iceland, Greenland, and Labrador.—Arrangements have, we learn, been made in the United States for a geological and geographical excursion in the North Atlantic, to be carried out in the coming summer under the direction of Dr. R. A. Daly, who, as mentioned in our last number, last year led a party from Harvard University to the Labrador coast. An opportunity will be offered of studying the volcanic and glacial phenomena of Iceland, the fiords and glaciers of western Greenland, and the mountains and fiords of northern Labrador, while independent studies in other branches of science may be made by members of the party. Explanatory lectures on the regions visited will be given from time to time, and, while Dr. Daly will act as guide on the Labrador coast, it is hoped that this office may be performed in Greenland and Iceland by specialists on the geology and physical geography of those countries. Intending members of the party, which is not limited to citizens of the United States, must forward a deposit of $250, or half of the inclusive fee for each member, before March 15. Application for membership is to be made to Dr. Daly at Harvard University.

OBITUARY.

Colonel Haffner.

Colonel Johan Frederick Wilhelm Haffner, until 1898 President of the Norwegian Geographical Society, died on Sunday, February 17 last, after a protracted illness, aged sixty-five years. In 1855 he joined the army, and rose until he was made colonel in 1891, and retired on account of age in the autumn of 1900. He made surveying his special study, and was, from 1888, chief of the topographical staff of the Norwegian army. In 1864 he also joined the Ordnance Survey Department, and became its director in 1888. During his term of office, the general survey of Norway proceeded rapidly, and the maps issued by the department are admired for their clearness and accuracy. In 1875 Colonel Haffner became a member of the Board of European Survey. In 1895 he represented Norway at the Geographical Congress in London. For a long series of years he was President of the Norwegian Geographical Society, and intimately connected with the formation of Nansen's celebrated polar expedition in the *Fram*. As a reward for his scientific labours he was made Knight Commander of the Order of St. Olaf of Norway, Knight of the Dannebrog of Denmark, St. Anne of Russia, the Crown of Italy, and of the Legion of Honour of France.

Frederick Pattison Pullar.

By James Chumley.

A melancholy interest attaches to the paper on the Scottish Lochs which appears in this number of the *Journal*, owing to the tragic death of one of the authors, Mr. F. P. Pullar, since the papers were passed for press. On February 15, while several hundred persons were skating on Airthrey Loch, in the grounds of

Airthrey Castle, near Bridge of Allan, the ice suddenly gave way, and a number of people were precipitated into the water. Mr. Pullar, who was a strong muscular young man and a powerful swimmer, at once rushed to the rescue of those who were immersed, plunging into the water and floating ice with his skates on. He successfully assisted three of them to land, and then went to the succour of a young lady, who was in an exhausted condition. He was repeatedly urged to save himself by many bystanders; this he refused to do. He supported the young lady for some time, but before help reached them his strength failed, and they both sank, their bodies not being recovered till three-quarters of an hour afterwards. This sad event cast a gloom over the whole district, and great sympathy was expressed for his bereaved parents and only sister, who had just left the ice before the accident occurred. On February 19 he was buried in Logie churchyard, attended by an immense concourse of mourners, and amid every expression of sorrow and sympathy.

Frederick Pattison Pullar was born at Bridge of Allan on December 20, 1875, and was the only son of Laurence Pullar, Esq., of The Lea, Bridge of Allan, and nephew of Sir Robert Pullar, of Perth. In his earlier years he was rather a delicate child, and much of his education was conducted at home under private tutors. Later on his health improved, and his education was continued at Stanley House School, Bridge of Allan, and the High School of Stirling. Afterwards he attended the Glasgow and West of Scotland Technical College, where he exhibited a marked ability for mathematics, mechanics, and applied science generally. He ultimately entered his father's business, but devoted a good deal of his time to scientific pursuits and studies.

About five or six years ago, while cruising in his father's yacht, the *Freya*, he, under the guidance of Sir John Murray, commenced to take an interest in oceanographical observations and problems, and exhibited a lively devotion to the practical work carried on at the Marine Biological Station at Millport. He enthusiastically embraced the study of meteorology, and established at his father's residence at Bridge of Allan a complete meteorological observatory, his instruments including deep-earth thermometers. He became a member of the Royal Meteorological Society, sending in reports regularly to the last-mentioned society during the past five or six years. He presented a complete set of meteorological instruments to the Scottish Hospital which proceeded to South Africa last year under Prof. John Chiene. A room in his father's house was fitted up as his own private workshop, in which he had many ingenious and interesting mechanical, electrical, and photographic contrivances, together with considerable geological collections.

About three years ago, in conjunction with Sir John Murray, he undertook a systematic bathymetrical survey of all the lochs of Scotland, and here his mechanical knowledge and inventive genius was at once exhibited by the improvements he made in the apparatus for taking the soundings. A portable machine was constructed from his designs, which could be firmly and rapidly fixed to the gunwale of the boat from which the soundings were to be taken. He also carried out many improvements in the methods of taking temperatures by means of deep-sea thermometers, in the plungers for procuring samples of the deposits, and in the apparatus for the capture of organisms at intermediate depths. At the time of his death, among other improvements, he had in contemplation the construction of a motor engine which could be applied to the propulsion of both a car and a boat, so that he might carry with him from his home a boat for taking soundings, transfer the engine to the boat, and re-transfer it, when the work was finished, to the car again. The publication of the results of the researches in the Scottish lochs was commenced last year, the first instalment, dealing with the lochs of the Callander and Trossachs district, being published in the *Journal* in April last, and the present number

contains two further instalments, dealing with lochs in the Forth and Tay basins; the survey of some other lochs has been completed, but the results are not yet in a state for publication.

In September last Sir John Murray left for the purpose of carrying out explorations on Christmas island, in the Indian ocean, and it was arranged that the parts in this number should be put into form and passed for press by Mr. Pullar. Sir John Murray returned to London on the evening of February 16, and on arrival at his hotel was handed a telegram announcing the death of his young friend on the previous day. They had made arrangements to devote most of the coming summer to the sounding of the lochs, with a view to a speedy completion of the entire survey; this important work will necessarily be interrupted by Mr. Pullar's lamented death.

Mr. Pullar was elected a Fellow of the Royal Geographical Society in 1896, and he was also a Fellow of the Royal Scottish Geographical Society. Last month he was admitted to the Fellowship of the Royal Society of Edinburgh.

Mr. Pullar was beloved by all who knew him. He was a man of great bodily and mental activity, lively disposition, generous and brave—knowing no fear. His friends were justified in believing that he would have a great future. His promising career has been cut short by an act of devotion. He sacrificed his life in an heroic endeavour to save the life of another.

"His life was gentle, and the elements
So mix'd in him, that Nature might stand up
And say to all the world, 'This was a man!'"

CORRESPONDENCE.

On the Approaches to Newfoundland and Adjacent Banks, with remarks re Currents, Ice, and Fog.

Much has been written about the coasts of Newfoundland and Novia Scotia, and the fogs and currents that prevail there, and many surveys of the outlying banks have been made. Scarcely any of these writings or surveys are of recent date, and are suited more particularly to the more leisurely epoch of the sailing vessel. It may not be out of place to review some of the incidents and facts connected with the passage of a steamer between the British Isles and America *viâ* Cape Race, Newfoundland (the shortest route).

When approaching the rugged and bold coast of Newfoundland in foggy weather, which is too frequent unfortunately, there is nothing to guide the mariner but the soundings, and these are of a character to be of little use, owing to their sameness, except in the vicinity of "Ballard" bank, where the water shoals quickly from 80 fathoms to 9 and 15 fathoms *on* the bank, and then deepens to about 30 fathoms, which depth is carried close to the shore. Further north, towards Cape Broyle, soundings of 80 fathoms can be found from close proximity to the shore to a distance of 50 miles to eastward, with varying kinds of bottom, which I have seldom found to compare with that marked on the charts. The French surveys of 1839 and 1856 are largely responsible for the soundings and description of bottom shown on our Admiralty Charts, with corrections by British surveys in 1880, 1895 and 1897. Several shoal spots are shown on the "Grand" and Sable banks, the existence of which is doubtful, notably the 5-fathom patch off south coast of Newfoundland in lat. 45° 45′ 30″ N., long. 54° 19′ 30″ W., which in itself would constitute a grave source of danger, as many large steamers pass that locality drawing 28 to 30 feet. During many voyages I have

tried to find this 5-fathom patch, when the sea was smooth, and although I have been quite sure of my position on many occasions, I have always found 48 fathoms instead of 5 fathoms, and a sandy bottom instead of mud.

Many times, both in clear weather and fog, when I have been sure of my position (and when I have been uncertain), have I ran "lines of soundings" by Lord Kelvin's machine every 15 minutes for several hours, and I have found them unsatisfactory generally, except that they inform one whether there is sufficient water under the ship or not. In these days of rapid ocean transit, it would be an unspeakable boon to have these banks thoroughly surveyed, with a view to enabling the mariner to at least approximate his position by soundings in this fog-clad region, and thereby expedite his safe arrival in port.

Current of varying strength is the next thing to be considered, and of which there can be less accuracy of report than in soundings. It can, however, be taken on general lines that the arctic current, which carries down such immense bodies of ice yearly, diffuses one part of itself round Cape Race in a south-westerly direction, and continues in this way over the "banks," often close to the shores of New Jersey. A little further south, and often close to the "line of soundings," the influence of the Gulf Stream is felt, but seldom with much strength. The proximity, however, of the hot and cold waters have enabled me to witness on many occasions the curious phenomenon of streaks of vapour rising from the surface of the ocean almost with the regularity of arrangement of furrows in a field, caused no doubt by the intermingling of jets of hot and cold water, or the over-running of a stratum of warm water. This steam or vapour often becomes so dense that it is fog in earnest.

This is one cause of fog I can vouch for, other causes are not so patent. The idea of hot atmospheric waves travelling north and coming in contact with the colder air, thus causing condensation and fog, or the evaporation from the warm water of the Gulf Stream being condensed by the cold winds and causing fog, is not easily grasped by every person when the temperature of sea and air do not vary more than 2° Fahr. Then, again, there are a variety of fogs, some wet and some dry, and varying in density, and, considering the different directions the wind may be blowing from during the existence of these fogs, it renders theories conflicting and hard to understand. Naturally, when the temperature of sea and air is practically similar, the conditions which produce the fog exist elsewhere.

Ice is the next thing to be discussed. This every one knows constitutes a great danger to shipping, both in the northern and southern hemispheres. It is a matter of very general belief that the thermometer will warn you of your approach to ice, and many ancient writers propound this theory. My experience, ranging over sixteen years in the Atlantic trade, experimenting at every opportunity, teaches me that in the case of being to leeward of a vast field of ice, the temperature of sea-surface, and air especially, may be found colder to a distance of a mile or two; but in the case of bergs, no perceptible difference will be noticed until too close to avoid collision if the vessel be moving even slowly through the water. Many times I have taken temperatures of sea and air as soon as I sighted an iceberg, and did so every ten minutes until within a quarter of a mile of it, and I found no change whatever. Another time I sighted icebergs a long way off, and noted temperatures, and in the course of four or five hours I had passed forty-five of them, varying from 1 to 7 miles distant, and the temperature did not at any time indicate their presence. Ice-blink *will* sometimes reveal the vicinity of these dread enemies of shipping, but nothing else that I am aware of while fog prevails.

H. Magill,
Ballymenoch Park, Holywood, co. Down. Captain ss. *Lord Devonshire*.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900–1901.

ELECTIONS, JANUARY 28, 1901.

Alfred Baldwin, M.P.; Captain George Howard Bretherton, D.S.O.; Rev. Charles William Hamilton Dicker; Captain L. D. Fraser, R.A.; Charles Henry Haines, M.D.; John Frank Jones; William Jump; J. A. Leavitt, D.D.; Captain Lloyd-Philipps, 1st Life Guards; Montes de Oca Manuel Augusto; Wordworth Poole, C.M.G., Physician to H.M.B. Legation, Peking; Valentin Virason; Henry Wellington Wack; Charles Richmond Weld, LL.D.

MEETING IN COMMEMORATION OF THE REIGN OF HER LATE MAJESTY QUEEN VICTORIA, EMPRESS OF INDIA, PATRON OF THE SOCIETY, FEBRUARY 11, 1901.

Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Frank M. Birch; William Cassap; Stanley Everard Clay; James W. Davidson; Major Colin Harding, C.M.G.; George Humphrey; Captain Langdale, R.N.; Major Anthony Hickman Morgan; Lord Oxmantoun; Walter Thornton.*

PROGRAMME.

1. The PRESIDENT: On Her Majesty's Connection with the Society and Interest in Geography, and on Polar Exploration during the Queen's Reign.

2. Right Hon. Sir GEORGE TAUBMAN GOLDIE, K.C.M.G.: Progress of Exploration and the Spread and Consolidation of the Empire in America, Australasia, and Africa.

3. Colonel Sir THOMAS H. HOLDICH, K.C.I.E., C.B.: Advances in Asia, and Imperial Consolidation in India.

4. The PRESIDENT: King Edward VII.

There was an Exhibition of Portraits of the Society's Presidents, and of the leading British Explorers, during Her Majesty's Reign.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *C. Rd.* **131** (1900): 1100–1102. **Lugeon.**

Prix Gay. Appliquer à une région de la France, on à une portion de la chaîne Alpine, l'analyse des circonstances géologiques qui ont déterminé les conditions actuelles du relief et de l'hydrographie. Par M. Maurice Lugeon.

Summary of a paper in which the author develops a theory of the origin of the Alpine valleys.

Holland. *B. American G.S.* **32** (1900): 308–321. **Griffis.**

The Heaths and Hollows of Holland. By W. Elliot Griffis.

On the geographical evolution of Holland.

Iceland. *J. Manchester G.S.* **16** (1900): 115–148. **Newby.**

Iceland and the Icelanders. By J. R. Newby. *Map and Illustrations.*

Notes collected during two autumn visits to Iceland.

Mediterranean—Cyprus. *Quarterly J. Geolog. S.* **56** (1900): 745–758. **Bellamy.**

A Description of the Salt-Lake of Larnaca, in the Island of Cyprus. By C. V. Bellamy. *With Maps.*

Norway. **Boyesen.**

A History of Norway from the Earliest Times. By Hjalmar H. Boyesen. With a New Chapter on the Recent History of Norway, by C. F. Keary. [The Story of the Nations.] London: T. Fisher Unwin, 1900. Size 8 × 5½, pp. xxxii. and 572. *Maps and Illustrations. Price 5s. Presented by the Publisher.*

The present is a re-issue for the Story of the Nations Series of Boyesen's 'Norway,' brought up to date by Mr. C. F. Keary after the author's death. The important part in geographical discovery played in old times by the adventurous Northmen, and by their modern representatives in our own day, renders the history of their country of unusual interest to geographers. The early voyages to America are, of course, only briefly touched upon, but the causes, geographical and others, which tended to promote a spirit of hardihood which had its outcome in such voyages, are well brought out. The author has given special prominence to the dramatic phases of historical events.

Norway and Sweden—Lapland. *J. Manchester G.S.* **16** (1900): 106–114. **Cowan.**

Across the Lapland Alps. By E. W. Cowan. *With Sketch-map and Illustrations.*

Description of a journey from Bodo to the head of the Skjerstad fjord and across the mountains to Lake Saggat, Jokkmokk, and Boden.

Russia. *B.S.G. Lille* **34** (1900): 277–286. **Lefebvre.**

Promenade en Russie. Par M. Napoléon Lefebvre.

A concise sketch of the main features of Russian geography.

Russia—Eastern Trade. *Kolon. Z.* **1** (1900): 342–345. **Rabe.**

Russlands Meeresforten und seine Etappenstrassen nach Indien und Ostasien. Von Rudolf Rabe. *With Illustrations.*

Russia—Kalmuck Steppe. *Deutsche Rundschau G.* **23** (1900): 97–108. **Rossmässler.**

Reise durch die Kalmükensteppe. Von F. Rossmässler. *With Illustrations.*

Russia—St. Petersburg. **Michell.**

Trade of Consular District of St. Petersburg for the year 1899. Foreign Office, Annual No. 2535, 1900. Size 9½ × 6, pp. 44. *Price* 2½*d.*

Spain—Gibraltar. **Jackson.**

Gibraltar. Report for 1899. Colonial Reports, Annual No. 305, 1900. Size 9½ × 6¼, pp. 24. *Price* 1½*d.*

Spain—Historical. *B.S.G. Madrid* **42** (1900): 97–102. **Blázquez.**

El teatro de la guerra de Munda. Por D. Antonio Blázquez.

On the geography of Cæsar's campaign against the Pompeians in Southern Spain.

Spain—Time. *B.S.G. Madrid* **42** (1900): 163–168. ———

La Hora de la Europa occidental en España. Real decreto de 26 de Julio de 1900.

Turkey. ———

Turkey in Europe. By Odysseus. London: Edward Arnold, 1900. Size 9 × 6, pp. 476. *Maps. Price* 16*s. Presented by the Publisher.*

This book is made up of papers written at various periods, but possessing a

certain unity as being all the result of a lengthened study of the real condition of Turkey and the causes to which that condition is due. The author, whose name does not appear, but who possesses an intimate acquaintance with Turkey and neighbouring countries, brings to his task a considerable amount of shrewd insight into the bearing of the facts observed, and the work should be of real value to all who wish to obtain a grasp of the factors which affect the problem of the near East. The writer considers that the errors of those who have dealt with Turkey arise from their failing to realize the fact that Turkey is quite unlike any other country in Europe.

Turkey. *M.G. Ges. Wien* **43** (1900): 231–236. **Oestreich.**

Vorläufige mittheilung über eine zweite Reise in die europäische Türkei. Von Dr. Karl Oestreich.

A short account of the journey referred to in the *Journal* for February, 1900 (p. 174).

United Kingdom. *Met. Record* **19** (1899): 49–68. **Marriott.**

Monthly Results of Observations made at the Stations of the Royal Meteorological Society, with Remarks on the Weather for the Quarter ending December 31, 1899. By William Marriott. *With Map.*

United Kingdom—England—Rainfall. **Marriott.**
Quarterly J.R. Meteorolog. S. **26** (1900): 273–280.

Rainfall in the West and East of England in relation to Altitude above Sea-level. By William Marriott. *With Diagrams.*

United Kingdom—England—Sussex. **Brabant.**

Sussex. By F. G. Brabant, M.A. Illustrated by Edmund H. New. London: Methuen & Co., 1900. Size 6¼ × 4, pp. xii. and 298. *Map and Illustrations. Price 3s. Presented by the Publishers.*

A most handy and compact guide to the county of Sussex, forming one of a series which is to deal eventually with all the English counties. In the introduction of 44 pages, the author gives a general account of the physical features, distribution of population, industries, history, etc., of Sussex, while in the body of the work the principal places are described in alphabetical order. The little book is tastefully got up, and the illustrations, from line-drawings by Mr. E. H. New, are much superior, from an artistic point of view, to many of the process reproductions so much in vogue at the present day.

United Kingdom—Ireland. *P.R. Irish A.* **6** (1900): 37–78. **O'Reilly.**

The Milesian Colonization considered in relation to Gold Mining. By J. P. O'Reilly.

The writer thinks it probable that the Milesians brought the knowledge of gold-mining to Ireland from Spain in 1044 B.C.

United Kingdom—Ireland. *P.R. Irish A.* **6** (1900): 100–180. **Westropp.**

The Churches of County Clare, and the Origin of the Ecclesiastical Divisions in that County. By T. J. Westropp. *With Map and Plates.*

United Kingdom—Ireland—Donegal. *Quarry* **5** (1900): 583–594. ———

The Mineral Industry of the United Kingdom—X. Donegal. *With Map and Illustrations.*

United Kingdom—Scotland. *P.R. Irish A.* **6** (1900): 26–32. **Kinahan.**

The Beaufort's Dyke, off the coast of the Mull of Galloway. By G. H. Kinahan. *With Chart.*

ASIA.

Afghanistan and Baluchistan. **Holdich.**

An Orographic Map of Afghanistan and Baluchistan. By Colonel Sir T. H. Holdich, K.C.I.E., C.B. (From the *Geographical Journal* for November, 1900.) Size 10 × 6½, pp. 6. *Map.*

Ceylon. **Thorburn.**

Ceylon. Report for 1899. Colonial Reports, Annual No. 307, 1900. Size 9½ × 6, pp. 40. *Price 2½d.*

The value both of imports and exports showed a marked increase in 1899 as compared with 1898. Plumbago-mining was very active. Tea exports reached almost 130 million lbs., an increase of 10 million. Rubber is being planted. The estimated population at the end of 1899 was 3,189,293. A high death-rate is accounted for by an unprecedented outbreak of malarial fever in the northern provinces.

Ceylon Tea. **Ferguson.**

The Rise of the Planting Enterprise and Trade in Ceylon Tea, by John Ferguson. Kandy: Published by the Planters' Association of Ceylon, 1900. Size 5½ × 4½, pp. 38.

China. **Reclus.**

Élisée Reclus. La Chine et la Diplomatie européenne. Paris: Éditions de l'Humanité Nouvelle, 1900. Size 9½ × 6½, pp. 16. *Presented by the Author.*

The author, as might be supposed, is a severe critic of European methods in China.

China—Chefu. *Petermanns M.* **46** (1900): 191–192. **Anz.**

Tschifu und Umgebung. Briefliche Mitteilung von Walter Anz. *With Map and Plan.*

China—Medical Reports. ——

China. Imperial Maritime Customs. 1.—Special Series: No. 2, Medical Reports, for the half-year ended 31st March, 1900. Shanghai; London: P. S. King & Son. 1900. Size 11 × 9, pp. vi. and 18. *Illustration. Presented by the Inspector-General of Chinese Customs.*

Eastern Asia. **Krausse.**

The Far East, its History and its Question. By Alexis Krausse. London: Grant Richards, 1900. Size 9 × 6, pp. xvi. and 372. *Maps. Price* 18*s. Presented by the Publisher.*

A useful summary of the history of Eastern Asia in its relations with Western civilization, preceded by a brief outline of the early history of the countries in question and of the geographical factors bearing on the political questions which await solution. These are fully discussed, the writer pointing out the inadequacy of British methods to counteract the growing influence of Russia. A series of maps illustrates the distribution of foreign interests in China, the railways open or planned, the territories hitherto absorbed by foreign powers, and other points of interest. There is a full chronological table of important events, a reprint of the text of treaties and conventions between the various Powers, and a comprehensive list of authorities.

Eastern Asia—Morphology. **Richthofen.**

Ueber Gestalt und Gliederung einer Grundlinieen der Morphologie Ost-Asiens. Von Ferdinand von Richthofen. (Sitzb. A. W. Berlin, xi., 1900.) Size 10 × 7, pp. 38. *Presented by the Author.*

An important paper on the tectonic lines of Eastern Asia.

India. ——

List of Proceedings, etc., India, 1834–1858. Preserved in the Record Department of the India Office, London. London, 1900. Size 13½ × 8½, pp. 60.

The proceedings are classified under the headings "Political," "Public Works," etc., but no further details of the subjects treated of are given.

Japan—Earthquake. *Petermanns M.* **46** (1900): 249–255. **Yamasaki.**

Das grosse japanische Erdbeben im nördlichen Honshū am 31. August 1896. Von Dr. N. Yamasaki. *With Map.*

Japan—Steamship company. **Laguérie.**

A travers le Monde, Tour du Monde **6** (1900): 377–380.

La Marine Japonaise. La "Nippon Yusen Kwaïsha." Par M. Villetard de Laguérie. *With Illustrations.*

On the great Japanese steamship company, and the lines of steamers.

Korea. *B. American G.S.* **32** (1900): 322–327. **Hulbert.**

Korea's Geographical Significance. By Homer B. Hulbert.

The writer lays stress on the ethnological no less than strategic importance derived by Korea from its geographical position.

Malay Archipelago—Java—Batavia. **De Haan.**

Tijds. Indische Taal-, Land- en Volkenk. **42** (1900): 567–583.

Uit Oud-Batavia: Kota-Tahi. Door Dr. F. De Haan. *With Plan.*

On the old fort Hollandia, in Batavia.

Pamirs—Radiation. *C. Rd.* **131** (1900): 879–880. **Stankewitch.**

Mesures actinométriques à Pamir. Note de M. B.-W. Stankewitch.

The observations on solar radiation here recorded were made during the summer of 1900.

Russia in Asia. **Krausse.**

Russia in Asia, a Record and a Study, 1558–1899. By Alexis Krausse. Second Edition. London: Grant Richards, 1900. Size 9 × 6, pp. xxx. and 412. *Maps. Price* 10*s. net. Presented by the Publisher.*

This is a second edition, with few alterations, of the work first published in 1899. It is a useful, though concise, account of Russian enterprise in Asia from the time of Yermak downwards. The portions which deal with Siberia are of special value, from the scarcity of English historical books on the subject, Mr. Ravenstein's 'Russians on the Amur' being practically the only previously available work of the kind. In his list of authorities, the author makes no allusion to Muller's important work.

Russia—East Siberia. *Meteorolog. Z.* **17** (1900): 116–124. **Woeikof.**

Mitteltemperaturen von Ostsibirien. Von A. Woeikof.

The observations here summarized, which relate to a long series of years, were brought together from the original sources by M. Tvitzsky, who records, among other data, the temperature of each month for the years 1876–1895.

Straits Settlements. **Egerton.**

Straits Settlements. Report for 1899. Colonial Reports, Annual No. 304, 1900. Size 9½ × 6, pp. 28. *Price* 2*d.*

The total external trade (apart from specie) has increased by 62 per cent. since 1895, by 32 per cent. since 1897, and by 16 per cent. since 1898. The total imports in 1899 reached £24½ million, and the exports £21½ million. Imports from the United Kingdom increased 2½ per cent. in 1899 in spite of a decrease in cotton piece goods, chiefly in favour of Asiatic countries. The low price of Liberian coffee is restricting cultivation, but a greatly increased production of tin in the federated Malay States was expected in 1900.

Tonkin and China. *C. Rd.* **131** (1900): 966–969. **Leclère.**

Sur la continuité tectonique du Tonkin avec la Chine. Note de M. A. Leclère. *Map.*

The author's geological investigations in Kwei-chau, Kwang-si, Yunnan, and Tonkin lead to the conclusion that the Hu-kwang tectonic arc defined by Richthofen is continued without deviation to the mouth of the Song-ka.

Turkey—Earthquake. *M.G. Ges. Wien.* **43** (1900): 221–230. **Schaffer.**

Das Maeanderthalbeben vom 20. September 1899. Von Dr. Franz Schaffer.

Western Asia. **Barthold.**

Russische Arbeiten über Westasien. Jahresbericht für 1899. Von W. Barthold. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. III. Zweite Abth. Pp. 218–236.) Berlin and Stuttgart: W. Spemann, 1900.

A useful summary of the contents of the principal Russian publications on Western Asia in 1899.

Western Asia. **Yate.**

Khurasan and Sistan. By Lieut.-Colonel C. E. Yate. Edinburgh and London: W. Blackwood & Sons, 1900. Size 9 × 6, pp. xii. and 442. *Map, Plan, and Illustrations. Price* 21*s. Two copies, one presented by the Author, the other by the Publishers.*

In this important work, Colonel Yate carries the description given in his 'Northern Afghanistan' further west into Persia on the basis of journeys carried out in 1893–98. He describes the time spent by him in the little-known country of the Goklan and Yamut Turkomans, and discusses many questions of interest relative to trade, railway communication, etc. Accounts are also given of a trip to the previously unvisited source of the Gurgan river, and a visit to the turquoise-mines of Madan.

AFRICA.

British Central Africa. **Sharpe.**

Trade and General Condition of the British Central Africa Protectorate for the Financial Year 1899. Foreign Office, Annual No. 2497, 1900. Size 9½ × 6½, pp. 40. *Price* 2½*d.*

See note in *Journal*, vol. xvi. p. 475.

British East Africa. **Marsden.**

Trade and Customs Revenue of the East Africa Protectorate for the year 1899. Foreign Office, Annual No. 2536, 1900. Size 9½ × 6½, pp. 18. *Price* 1½*d.*

The revenue for 1899–1900 shows a satisfactory increase of 7 per cent., the shipments of ivory have doubled, and those of rubber show an advance of 40 per cent.,

though still far below the producing power of the country. A direct line of steamers between London and Mombasa is greatly needed.

British South Africa. **Gell.**

The Rubber Industry in the British South Africa Company's Territories. By P. Lyttelton Gell. London: British South Africa Co., 1900. Size 8½ × 6½, pp. viii. and 28. *Presented by the British South Africa Co.*

Immediate legislation for the regulation and protection of the rubber industry is advocated, as well as the establishment of a scientific department of forestry.

British South Africa. **Hensman.**

A History of Rhodesia, compiled from official sources. By Howard Hensman. Edinburgh and London: W. Blackwood & Sons, 1900. Size 8 × 5½, pp. xx. and 382. *Map. Price* 6*s. Presented by the Publishers.*

A useful summary of the principal facts connected with the origin and development of Rhodesia as a British possession. The history of the country before 1888 is very briefly touched upon. The total out-turn of gold from November, 1891, to June, 1900, is given as 125,662 ounces.

French Sahara—Adrar. *Ann. G.* **9** (1900): 458–462. **[Dereims.]**

La Mission Paul Blanchet.

See note in *Journal* for January, *ante*, p. 72.

French West Africa—Dahomey. **Brunet and Giethlen.**

Exposition Universelle de 1900.—Les Colonies Françaises. Dahomey et Dépendances. Historique général, Organization, Administration, Ethnographie, Productions, Agriculture, Commerce. Par L. Brunet et Louis Giethlen. Paris: A. Challamel, 1900. Size 9½ × 6, pp. xii. and 544. *Map and Illustrations. Price* 5*s.* 8*d.*

This is the best account we yet possess of the general history and geography of Dahome. The ethnography, productions, industry, commerce, etc., are treated of in separate sections. The map—by the author of the recently published atlas of the French colonies—is very clear, though the scale employed (1 : 3,700.000) involves the use of somewhat small lettering.

French West Africa—Senegal. **Lasnet, Chevalier, Cligny, Rambaud.**

Exposition Universelle de 1900.—Les Colonies Françaises. Une Mission au Sénégal. Ethnographie, Botanique, Zoologie, Géologie. Par MM. Dr. Lasnet, Aug. Chevalier, A. Cligny, Pierre Rambaud. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 348. *Map and Illustrations.*

This valuable work gives the results of the "Mission Économique du Sénégal, 1899–1900. The information it contains on the native races of Senegal is particularly full and complete. Other sections treat of the flora and fauna, especially from an economic point of view, and the work concludes with a short account of the hydrography and geology, including the mineral resources.

French West Africa—Senegal.

Exposition Universelle de 1900. Les Colonies Françaises. Le Sénégal. Organisation politique, Administration, Finances, Travaux publics. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 430. *Maps and Plans.*

This work contains a large amount of useful statistical information on the administration, commerce, agriculture, etc., of the French colony of Senegal. There are special maps of St. Louis and its environs, and of the zones of cultivation of ground-nuts, the export of which reached a value of £480,000 worth in 1899.

German East Africa. *Deutsche Rundschau G.* **23** (1900): 129–132. **Andresen.**

Die wirthschaftliche Entwickelung Deutsch-Ostafrikas. Von P. Andresen.

On the resources and prospects of German East Africa.

German East Africa—Language. **Spiss.**

Kihehe-Wörter-Sammlung. Kihehe-Deutsch und Deutsch-Kihehe. Von P. Cassian Spiss, O.S.B. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 114-190.) Berlin and Stuttgart: W. Spemann, 1900.

German East Africa—Language. **Velten.**

Kikami, die Sprache der Wakami in Deutsch-Ostafrika. Von C. Velten. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 1–56.) Berlin and Stutfgart: W. Spemann, 1900.

German East Africa—Place Names. **Müller.**

Erklärung einiger ostafrikanischer Ortsnamen. Von Franz Müller. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 208–210.) Berlin and Stuttgart: W. Spemann, 1900.

The names dealt with are those of places in the coast-lands of German East Africa.

German South-West Africa—Ethnology. **Brincker.**

Charakter, Sitten und Gebräuche speciell der Bantu Deutsch-Südwestafrikas. Von Dr. P. H. Brincker. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 66–92.) Berlin and Stuttgart: W. Spemann, 1900.

German South-West Africa—Terminology. **Dove.**

Geographische Bezeichnungen in der Namasprache. Von Dr. K. Dove. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii. Dritte Abth. Pp. 57–65.) Berlin and Stuttgart: W. Spemann, 1900.

On the geographical terminology employed in the Nama language.

German West Africa—Togoland. **Preil.**

Deutsche Kolonialzeitung **17** (1900): 549–550, 566–567.

Eine Otifahrt. Von Oberleutnant Preil. *With Map and Illustrations.*

On a survey of the upper Oti, Togoland, in 1899.

German West Africa—Togo. **Seidel.**

Deutsche Rundschau G. **23** (1900): 14–20, 117–125.

Nord-Togo oder der deutsche Sudan. Von H. Seidel.

A clear sketch of the physical geography of Northern Togoland.

Madagascar—Agriculture. *Questions Dipl. et Colon.* **10** (1900): 540–548. **Gautier.**

L'agriculture européenne à Madagascar. Par E. F. Gautier. *With Map.*

The writer sketches the present state of agriculture in Madagascar, showing the disadvantages under which it suffers from the want of co-operation between private and public effort. Another great obstacle arises from the fact that the fertile regions are in one part, and the labour supply in another.

Madagascar—Ethnology. *B. American G. S.* **32** (1900): 297–307. **Hunt.**

Madagascar. By W. H. Hunt.

This paper deals chiefly with the ethnology of Madagascar, but contains notes on recent topographical work. The writer insists that the basis of the population of the whole island is Oriental.

Mauritius and Rodrigues. **Bower.**

Mauritius and Rodrigues. Reports for 1899. Colonial Reports, Annual No. 302, 1900. Size 9½ × 6, pp. 64. *Price* 3½*d.*

The financial position of the colony at the end of 1899 is said to have been full of hope, apart from the anxiety caused by the plague. The war in the Philippines has given an impetus to the fibre industry, and 1899 was also a good year for sugar.

Sahara. *Rev. Française* **25** (1900): 645–647. **Foureau.**

De l'Aïr a Zinder. Mission Foureau-Lamy. Par F. Foureau.

A reprint of M. Foureau's letter to the Paris Geographical Society.

Tunis. *Ann. G.* **9** (1900): 434–455. **Pervinquière.**

La Tunisie centrale. Esquisse de géographie physique. Par L. Pervinquière. *With Illustrations.*

Tunis—Colonization. *B.S.G. Com. Havre* **17** (1900): 27–38, 65–90. **Saurin.**

L'Invasion sicilienne et le peuplement Français de la Tunisie. Par Jules Saurin.

The author points out the increasing emigration of Italians to Tunis, and urges the importance of the introduction of French agricultural settlers.

NORTH AMERICA.

Alaska—Mount St. Elias. **Vedova.**

G. Dalla Vedova. La salita sul Monte di S. Elia nell' Alaska. (Estratto dalla *Rivista d'Italia*, fasc. 1, 1900.) Roma, 1900. Size 9½ × 6½, pp. 14. *Presented by the Author.*

Review of Dr. de Filippi's work on the ascent of St. Elias.

Canada—Alberta and British Columbia. **McEvoy.**

Report on the Geology and Natural Resources of the country traversed by the Yellow Head Pass route from Edmonton to Tête Jaune Cache, comprising portions of Alberta and British Columbia. By James McEvoy. (Geological Survey of Canada. Part D, Annual Report, vol. xi.) Ottawa, 1900. Size 10 × 6½, pp. 44. *Map and Illustrations. Presented by the Geological Survey of Canada.*

The route of the exploration here described led from Edmonton to Brulé lake, on the Athabasca, over a rolling wooded plain, and thence westward through high rugged mountains traversed by low valleys.

Canada—Ethnology. *P. and T.R.S. Canada* 5 (1899) (Sec. ii.): 199-211. **Lighthall.**

Hochelagans and Mohawks, a Link in Iroquois History. By W. D. Lighthall.

The author brings forward facts in support of the theory that the Mohawks of the Iroquois confederation were, in part at least, the ancient race found settled at Hochelaga by Cartier in 1535, but which had completely disappeared in 1608.

United States—Coal. ———

Special Consular Reports. Foreign Markets for American Coal. Vol. xxi. part i. Washington, 1900. Size 9 × 6, pp. 312.

United States—Montana. **Pearce.**

Mining and Metallurgical Industry in Butte District, Montana. Foreign Office, Miscellaneous, No. 541, 1900. Size 9½ × 6½, pp. 10. *Price* 1*d.*

United States—Washington—Mt. Rainier. **Van Trump and others.**

Mazama 2 (1900): 1-40.

Mount Rainier. By P. B. Van Trump. The Geology of Mount Rainier. By G. Otis Smith. Rainier. By E. T. Parsons. Professor McClure's Report. *With Map and Illustrations.*

The first paper gives an account of early attempts on Mount Rainier, and the first successful ascent by the writer and General Stevens in 1879.

CENTRAL AND SOUTH AMERICA.

Andes. *XVII. Jahresb. G. Ges. Bern* (1898-1899): 161-178. **Wehrli.**

Reisebilder aus den Anden. Von Dr. Leo Wehrli. *With Illustrations.*

The section of the Andes here described is that cut by 41° S. lat.

Argentine Republic. **Klett.**

Estudios sobre producción, comercio, finanzas é intereses generales de la República Argentina. Por Cárlos Lix Klett. Con una Introducción de Enrique M. Nelson. 2 vols. Buenos Aires, 1900. Size 10½ × 7½, pp. xxxii., 1696, and xliv. *Maps and Illustrations. Presented by the Author.*

An exhaustive study of questions relating to Argentine industries, commerce, etc., which should prove of much value for purposes of reference.

Argentine Republic. ———

Anuario de la Dirección General de Estadistica Correspondiente al Año 1899. Tomo i. Buenos Aires, 1900. Size 10½ × 7½, pp. xviii. and 534.

Bahamas. **Churchill.**

Bahamas. Report for 1899. Colonial Reports, Annual No. 268, 1900. Size 9½ × 6½, pp. 48. *Price* 2½*d.*

It is estimated that the area in the Bahamas under Sisal hemp (*Agave sisalana*) cultivation now exceeds 14,000 acres.

Brazil. *XVII. Jahresb. G. Ges. Bern* (1898-1899): 147-160. **Mann.**

Kreuz und quer durch Brasilien. Von Carl R. Mann.

Based on previously published works.

Costa Rica and Colombia. *Petermanns M.* 46 (1900): 255-261. **Seler.**

Die Grenzstreit zwischen den Republiken Costarica und Columbia. Von Prof. Dr. Ed. Seler. *With Map.*

The map shows the frontier as defined by the award of the arbitrator as well as the extreme claims of both parties.

Peru—Handbook. **Cisneros and Garcia.**

Guia ilustrada de Lima, el Callao y sus alrededores. Por Carlos B. Cisneros y Rómulo E. Garcia. Lima, 1898. Size 8½ × 5½, pp. 214 and xxx. *Illustrations.*

Peru—Irrigation. **Moreno.**
Perú. Las irrigaciones de la Costa. . . . Por Federico Moreno. Lima, 1900. Size 8 × 6, pp. 226.

Strait of Magellan and Tierra del Fuego. **Chaigneau.**
Derrotero del Estrecho de Magallanes i de la Tierra del Fuego. Por J. Federico Chaigneau. Valparaiso, 1900. Size 10 × 7, pp. 242.

Uruguay. **Hervey.**
Trade of Uruguay for the year 1899 and part of 1900. Foreign Office, Annual No. 2538, 1900. Size 9½ × 6½, pp. 12. *Price* 1*d.*

West Indies—Bahamas. **Churchill.**
Bahamas. Notes on the Planting of the Pita Plant (Agave Sisalana) and the extraction and preparation of the fibre. Colonial Reports, Miscellaneous, No. 14, 1900. Size 10 × 6½, pp. 8. *Price* ½*d.*

West Indies—Dominican Republic. **Gosling.**
Trade of the Dominican Republic for the year 1899. Foreign Office, Annual No. 2537, 1900. Size 10 × 6½, pp. 8. *Price* ½*d.*

West Indies—Hayti. **Prichard**
Where Black rules White. A Journey across and about Hayti. By Hesketh Prichard. London: A. Constable & Co., 1900. Size 10 × 6½, pp. 288. *Illustrations. Price* 12*s. Presented by the Publishers.*

A brightly written account of the journey already described in the *Journal* (vol. xvi. p. 306). The author gives a vivid, though a far from pleasing picture, of the present condition of Hayti, and in reply to the question, Can the Negro rule himself? gives it as his opinion that we may go beyond the non-proven of the Scottish courts, and say that "taken *en masse*, at any rate, he has shown no signs whatever which could fairly entitle him to the benefit of the doubt that has for so long hung about the question."

West Indies—Porto Rico. *B. American G.S.* **32** (1900): 328–330. **Gannett.**
The Census of Porto Rico. By Henry Gannett.

On the census taken by the U.S. War Department in the autumn of 1899.

West Indies—Trinidad and Tobago. **Bourne.**
Trinidad and Tobago. Report for 1899. Colonial Reports, Annual No. 303, 1900. Size 9½ × 6½, pp. 44. *Price* 2½*d.*

The year 1899 was a satisfactory one, as regards finance, trade, and agriculture. Sugar and cacao are still the principal products, but coffee, rubber, and timber are also receiving attention. The results of experiments at the St. Clair botanical station show that improved varieties of canes may yield a larger supply of sugar. The abnormally low rainfall of 1900 has prejudicially affected the sugar crop, but the effect has been partially counteracted by higher prices.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Rutlidge.**
Souvenir of the Farewell Banquet to the Right Honourable the Earl of Hopetown, Governor-General of Australia. Edited by Chas. S. Rutlidge. Size 15 × 10, pp. 42. *Illustrations.*

This contains an illustrated account of the various Australian colonies.

Australia—Meteorology. **Wragge.**
Meteorological Work in Australia. Interview with Mr. Clement L. Wragge, Government Meteorologist of Queensland. (From the *British Australasian*, October 25, 1900. Pp. 1506–1507.) Size 14 × 9. *Portrait.*

Fiji. **Allardyce.**
Fiji. Report for 1899. Colonial Reports, Annual No. 296, 1900. Size 10 × 6, pp. 26. *Price* 2*d.*

The exports of sugar during 1899 reached a figure of £340,602 as compared with £409,884 in 1898, but the latter was an exceptional year. Cane is being now cultivated by Indian coolies who have completed their term of indenture.

POLAR REGIONS.

Arctic—Greenland. *Globus* **78** (1900): 329–333. **Neger.**
Die schwedische Hülfsexpedition nach Ostgrönland zur Aufsuchung Andrées im Sommer 1899, unter A. G. Nathorst. Von F. W. Neger. *With Maps and Illustrations.*

Based on Dr. Nathorst's report in *Ymer.*

Arctic—Nansen's Expedition. *Petermanns M.* **46** (1900): 287–290. **Pompeckj.**
Wissenschaftliche Ergebnisse von Nansens Polarexpedition. Von J. F. Pompeckj.

Arctic—Swedish Expedition. *Ymer* **20** (1900): 325–329. **Pettersson and Östergren.**
Vattenprof tagna under "1900 års svenska zoologiska polarexpedition." Af O. Pettersson och Hj. Ostergren.
On specimens of sea-water collected by the Hjort-Nansen expedition.

Franz Josef Land. **Nathorst.**
The Norwegian North Polar Expedition 1893–1896. Scientific Results edited by Fridtjof Nansen. III. Fossil Plants from Franz Josef Land. By A. G. Nathorst. London: Longmans & Co. [1899]. Size 11½ × 9, pp. 26. *Plates.*

Greenland—East Coast. *Ymer* **20** (1900): 229–236. **Dusén.**
Om Kartläggningen af Kejsar Franz Josefs fjord och Konung Oscars fjord. Af P. Dusén.
On the methods employed in the mapping of the fjords surveyed by Dr. Nathorst's Expedition (cf. *ante*, p. 60).

Spitsbergen—Degree Measurement. *Ymer* **20** (1900): 209–227. **Carlheim-Gyllensköld.**
Uppmätning af en meridiangradbåge på Spetsbergen genom en svensk-rysk expedition. Af V. Carlheim-Gyllensköld. *With Illustrations.*
A general account of the work of the Swedish and Russian parties, with extracts from Mr. Rubin's report on explorations in the vicinity of Mount Chydenius.

Spitsbergen—Degree Measurement. *Ymer* **20** (1900): 281–302. **De Geer.**
Om gradmätningsnätets framförande öfver södra och mellersta Spetsbergen. Af Gerard De Geer. *With Map.*
On the degree-measurement operations in Central and Southern Spitsbergen.

MATHEMATICAL GEOGRAPHY.

Geodesy.
Jahresbericht des Direktors des Königlichen Geodätischen Instituts für die Zeit von April 1899 bis April 1900. (Veröffentlichung des Königl. Preussischen Geodätischen Instituts. N.F. No. 4.) Potsdam, 1900. Size 9½ × 6½, pp. 34.

Latitude and Longitude. *B. American Bureau G.* **1** (1900): 144–151. **Gildemeister.**
Illustrative Lesson upon Latitude and Longitude for Fourth Grade or above. By Theda Gildemeister.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climates. *G.Z.* **6** (1900): 593–611, 657–679. **Köppen.**
Versuche einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt. Von Prof. Dr. W. Köppen. *With Maps.*
This will be specially noticed.

Continents and Oceans. *B. American Bureau G.* **1** (1900): 234–241. **Collie.**
The Gross Topography of the Globe. By G. L. Collie.

Deserts. **Walther.**
Das Gesetz der Wüstenbildung in Gegenwart und Vorzeit. Von Johannes Walther. Herausgegeben mit Unterstützung der Königl. Akademie der Wissenchaften zu Berlin. Berlin: D. Reimer (Ernst Vohsen), 1900. Size 11 × 7½, pp. xiv. and 176. *Illustrations. Price* 12 *m. Presented by the Publisher.*
This will be specially noticed.

Meteorology—Temperature. *C. Rd.* **131** (1900): 920–922. **Teisserenc de Bort.**
Variation saisonnière de la température à diverses hauteurs dans l'atmosphère libre. Note de M. Léon Teisserenc de Bort. *With Diagram.*
The results of an extended series of observations by means of balloons prove that a well-marked seasonal variation of temperature in the free atmosphere occurs to a height of at least 10,000 metres (32,800 feet).

Oceanography. *Ymer* **20** (1900): 243–259. **Théel.**
Om "bipolaritet" i hafsorganismernas utbredning. Af Hjalmar Théel.
On resemblances between the marine faunas of the north and south polar regions.

Vegetation and Rivers. *Meteorolog. Z.* **17** (1900): 491–504. **Wollny.**

Ueber den Einfluss der Pflanzendecken auf die Wasserführung der Flüsse. Von Professor Dr. E. Wollny.

A detailed investigation into the effects of a surface covering of vegetation in a country on the water-supply of its rivers. Cf. *ante*, p. 311.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. **Guy.**

Des moyens de provoquer l'adaptation des produits de l'industrie aux besoins du commerce extérieur et aux habitudes des populations. Par M. Camille Guy. Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude, 2e Section—Question iii. Paris: Société de Géographie Commerciale. Size 10½ × 7, pp. 18.

Commercial Geography. *B. American Bureau G.* **1** (1900): 141–143. **Poe.**

A Lesson Plan for the study of a Natural Product. By Clara L. Poe.

BIOGRAPHY.

Cesnola. **Vedova.**

G. Dalla Vedova. Il Conte L. Palma di Cesnola e il Museo Metropolitano di Nuova York. (Estratto dalla *Rivista d'Italia*, fasc. 3°, 1899.) Roma, 1899. Size 10 × 6½, pp. 16. *Presented by the Author.*

Based on a work by Dr. Roversi published in New York in 1898.

Kersten. *Globus* **78** (1900): 386–387. **Andree.**

Erinnerungen an Otto Kersten. Von R. Andree. *With Portrait.*

See note, *ante*, p. 199.

La Caze. *B.S.G. Rochefort* **22** (1900): 137–144. **Richemond.**

Vacher de La Caze, prince d'Amboule. Par M. de Richemond.

La Caze took a foremost part in the French undertakings in Madagascar in the seventeenth century.

Preuss. *Deutsche Kolonialzeitung* **17** (1900): 551–552, 565. ——

Unsere Kolonialpioniere. *With Portrait and Plan.*

Dr. Preuss, a German pioneer in the Cameroons, has lately carried out a successful journey in South America for the study of its economic botany. The plan shows the botanic garden at Victoria, Cameroons.

Richthofen. *G. Anzeiger* (*Petermanns M.*) (1900): 141–143. **Rohrbach**

Ferdinand von Richthofen. Von Dr. C. Rohrbach. *With Portrait.*

Roberval. *P. and T.R.S. Canada* **5** (1899), (Sec. i.): 71–78. **Dionne.**

Jean-François de La Rocque, Seigneur de Roberval. Par M. N. E. Dionne.

A short account of Roberval's life and voyages to the St. Lawrence.

GENERAL.

Almanac. ——

Annuaire pour l'an 1901, publié par le Bureau des Longitudes. Avec des Notices scientifiques. Paris: Gauthier-Villars. Size 6 × 4, pp. iv. 636, and [264].

French Colonies. **Mourey and Brunel.**

L'Année Coloniale, publiée sous la direction de MM. Ch. Mourey et Louis Brunel. Première Année (1899), avec la collaboration de MM. le Général Gallieni, Picquié et Teissier. Paris: C. Tallandier. Size 9 × 6, pp. viii. and 414. *Maps and Illustrations. Price* 4*s.* 6*d.*

This promises to be a most useful publication, bringing together into small compass a mass of information on the French Colonies otherwise scattered through a voluminous literature.

Geographical Congress. *B.S.G. de l'Est* **21** (1900): 7–50. **Auerbach**

Rapport sur les travaux du VII° Congrès international de géographie tenu à Berlin du 28 Septembre au 4 Octobre 1899 et sur la visite du port de Hambourg (5–6 Octobre 1899). Par B. Auerbach.

Arctic—Nansen's Expedition. *Petermanns M.* **46** (1900): 287–290. **Pompeckj.**
Wissenschaftliche Ergebnisse von Nansens Polarexpedition. Von J. F. Pompeckj.

Arctic—Swedish Expedition. *Ymer* **20** (1900): 325–329. **Pettersson and Östergren.**
Vattenprof tagna under "1900 års svenska zoologiska polarexpedition." Af O. Pettersson och Hj. Ostergren.

On specimens of sea-water collected by the Hjort-Nansen expedition.

Franz Josef Land. **Nathorst.**
The Norwegian North Polar Expedition 1893–1896. Scientific Results edited by Fridtjof Nansen. III. Fossil Plants from Franz Josef Land. By A. G. Nathorst. London: Longmans & Co. [1899]. Size 11½ × 9, pp. 26. *Plates.*

Greenland—East Coast. *Ymer* **20** (1900): 229–236. **Dusén.**
Om Kartläggningen af Kejsar Franz Josefs fjord och Konung Oscars fjord. Af P. Dusén.

On the methods employed in the mapping of the fjords surveyed by Dr. Nathorst's Expedition (cf. *ante*, p. 60).

Spitsbergen—Degree Measurement. *Ymer* **20** (1900): 209–227. **Carlheim-Gyllensköld.**
Uppmätning af en meridiangradbåge på Spetsbergen genom en svensk-rysk expedition. Af V. Carlheim-Gyllensköld. *With Illustrations.*

A general account of the work of the Swedish and Russian parties, with extracts from Mr. Rubin's report on explorations in the vicinity of Mount Chydenius.

Spitsbergen—Degree Measurement. *Ymer* **20** (1900): 281–302. **De Geer.**
Om gradmätningsnätets framförande öfver södra och mellersta Spetsbergen. Af Gerard De Geer. *With Map.*

On the degree-measurement operations in Central and Southern Spitsbergen.

MATHEMATICAL GEOGRAPHY.

Geodesy.
Jahresbericht des Direktors des Königlichen Geodätischen Instituts für die Zeit von April 1899 bis April 1900. (Veröffentlichung des Königl. Preussischen Geodätischen Instituts. N.F. No. 4.) Potsdam, 1900. Size 9½ × 6½, pp. 34.

Latitude and Longitude. *B. American Bureau G.* **1** (1900): 144–151. **Gildemeister.**
Illustrative Lesson upon Latitude and Longitude for Fourth Grade or above. By Theda Gildemeister.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climates. *G.Z.* **6** (1900): 593–611, 657–679. **Köppen.**
Versuche einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt. Von Prof. Dr. W. Köppen. *With Maps.*

This will be specially noticed.

Continents and Oceans. *B. American Bureau G.* **1** (1900): 234–241. **Collie.**
The Gross Topography of the Globe. By G. L. Collie.

Deserts. **Walther.**
Das Gesetz der Wüstenbildung in Gegenwart und Vorzeit. Von Johannes Walther. Herausgegeben mit Unterstützung der Königl. Akademie der Wissenchaften zu Berlin. Berlin: D. Reimer (Ernst Vohsen), 1900. Size 11 × 7½, pp. xiv. and 176. *Illustrations. Price* 12 *m. Presented by the Publisher.*

This will be specially noticed.

Meteorology—Temperature. *C. Rd.* **131** (1900): 920–922. **Teisserenc de Bort.**
Variation saisonnière de la température à diverses hauteurs dans l'atmosphère libre. Note de M. Léon Teisserenc de Bort. *With Diagram.*

The results of an extended series of observations by means of balloons prove that a well-marked seasonal variation of temperature in the free atmosphere occurs to a height of at least 10,000 metres (32,800 feet).

Oceanography. *Ymer* **20** (1900): 243–259. **Théel.**
Om "bipolaritet" i hafsorganismernas utbredning. Af Hjalmar Théel.

On resemblances between the marine faunas of the north and south polar regions.

Vegetation and Rivers. *Meteorolog. Z.* **17** (1900): 491–504. **Wollny.**

Ueber den Einfluss der Pflanzendecken auf die Wasserführung der Flüsse. Von Professor Dr. E. Wollny.

A detailed investigation into the effects of a surface covering of vegetation in a country on the water-supply of its rivers. Cf. *ante*, p. 311.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. **Guy.**

Des moyens de provoquer l'adaptation des produits de l'industrie aux besoins du commerce extérieur et aux habitudes des populations. Par M. Camille Guy. Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude, 2e Section—Question iii. Paris: Société de Géographie Commerciale. Size $10\frac{1}{2} \times 7$, pp. 18.

Commercial Geography. *B. American Bureau G.* **1** (1900): 141–143. **Poe.**

A Lesson Plan for the study of a Natural Product. By Clara L. Poe.

BIOGRAPHY.

Cesnola. **Vedova.**

G. Dalla Vedova. Il Conte L. Palma di Cesnola e il Museo Metropolitano di Nuova York. (Estratto dalla *Rivista d'Italia*, fasc. 3°, 1899.) Roma, 1899. Size $10 \times 6\frac{1}{2}$, pp. 16. *Presented by the Author.*

Based on a work by Dr. Roversi published in New York in 1898.

Kersten. *Globus* **78** (1900): 386–387. **Andree.**

Erinnerungen an Otto Kersten. Von R. Andree. *With Portrait.*

See note, *ante*, p. 199.

La Caze. *B.S.G. Rochefort* **22** (1900): 137–144. **Richemond.**

Vacher de La Caze, prince d'Amboule. Par M. de Richemond.

La Caze took a foremost part in the French undertakings in Madagascar in the seventeenth century.

Preuss. *Deutsche Kolonialzeitung* **17** (1900): 551–552, 565. ——

Unsere Kolonialpioniere. *With Portrait and Plan.*

Dr. Preuss, a German pioneer in the Cameroons, has lately carried out a successful journey in South America for the study of its economic botany. The plan shows the botanic garden at Victoria, Cameroons.

Richthofen. *G. Anzeiger (Petermanns M.)* (1900): 141–143. **Rohrbach**

Ferdinand von Richthofen. Von Dr. C. Rohrbach. *With Portrait.*

Roberval. *P. and T.R.S. Canada* **5** (1899), (Sec. i.): 71–78. **Dionne.**

Jean-François de La Rocque, Seigneur de Roberval. Par M. N. E. Dionne.

A short account of Roberval's life and voyages to the St. Lawrence.

GENERAL.

Almanac. ——

Annuaire pour l'an 1901, publié par le Bureau des Longitudes. Avec des Notices scientifiques. Paris: Gauthier-Villars. Size 6×4, pp. iv. 636, and [264].

French Colonies. **Mourey and Brunel.**

L'Année Coloniale, publiée sous la direction de MM. Ch. Mourey et Louis Brunel. Première Année (1899), avec la collaboration de MM. le Général Gallieni, Picquié et Teissier. Paris: C. Tallandier. Size 9×6, pp. viii. and 414. *Maps and Illustrations. Price 4s. 6d.*

This promises to be a most useful publication, bringing together into small compass a mass of information on the French Colonies otherwise scattered through a voluminous literature.

Geographical Congress. *B.S.G. de l'Est* **21** (1900): 7–50. **Auerbach**

Rapport sur les travaux du VII° Congrès international de géographie tenu à Berlin du 28 Septembre au 4 Octobre 1899 et sur la visite du port de Hambourg (5–6 Octobre 1899). Par B. Auerbach.

Merchant Marine.

Special Consular Reports. Merchant Marine of Foreign Countries. Vol. xviii. Washington, 1900. Size 9 × 6, pp. xvi. and 182.

Pearl Oysters. **Collett.**

Pearl Oysters and Pearl Fisheries. By Oliver Collett. (Reprinted from *Ceylon Observer*.) Meeting of the Ceylon Branch, Royal Asiatic Society, on October 27. Size 10 × 7½, pp. 12. *Presented by the Ceylon Branch, Royal Asiatic Society.*

Scientific Societies. **Evans.**

The Origin, Development and Aims of our Scientific Societies. Address at the Opening Meeting of the 147th Session of the Society of Arts, November 21, 1900. By Sir John Evans, K.C.B., etc. London: Printed by W. Trounce, 1900. Size 8½ × 5½, pp. 32. *Presented by the Author.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary. **Artaria.**

Eisenbahn- u. Postkarte von Oesterreich-Ungarn. Vierte Neubearbeitung. Scale 1: 1,500,000 or 23·6 stat. miles to an inch. Verlag von Artaria & Co. Wien, 1901. *Price 2 Kronen. Presented by the Publishers.*

A new edition of Artaria & Co.'s useful railway and postal map of Austria-Hungary, with an alphabetical index to the stations. The various railway lines are distinguished by different colours and symbols, a full explanation of which is given.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from January 1 to 31, 1901.

1-inch—General Map:—

ENGLAND AND WALES (revision):—printed in colours, 192, 209 (combined); 226, 227, 244 (combined). 1*s. each.*

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Anglesey,** 2 N.W., S.W., S.E., 3 S.W., S.E., 5 S.W., S.E., 6 N.E. **Carnarvonshire,** 13 N.W., N.E., S.E., 19 N.W., 23 N.W., 30 N.W. **Cumberland,** 25 N.E., S.E., 26A S.W., 27 N.E., S.E., 28 S.E., 32 N.W., N.E., 34 S.E., 35 N.W., S.E., 36 N.W., N.E., S.E., 37 S.W., S.E., 38 N.W., N.E., S.W., 39 N.W., S.W., S.E., 40 N.W., N.E., S.W., 42 S.E., 44 S.E., 45 S.E., 46 N.W., 52 N.E., 59 N.W., 60 N.W., 66 S.W., 70 N.W., 71 N.W., 75 N.E., S.W., S.E., 76 N.W., 80 (N.W. and N.E.). **Denbighshire,** 33 S.E. **Derbyshire,** 36 S.W., 42 N.E. **Glamorganshire,** 14 N.W., 18 S.E., 19 S.W., 24 S.W., 28 N.W., S.W. **Northamptonshire,** 22 N.E., 23 N.E., S.E., 24 N.W., 29 N.W., N.E., 30 N.E., 31 N.E., S.W., S.E., 32 S.W., 36 N.W., S.E., 37 S.W., 38 N.E., 39 S.E., 42 S.E., 43 S.E., 46 N.W., N.E., 49 N.E., 50 S.W., 51 N.W., 52 N.W., S.W. **Nottinghamshire,** 2 N.E., 3 N.W., 21 S.E., 27 S.W., S.E., 32 N.E., 33 S.E., 35 N.W., N.E., 38 N.E., 39 N.W., 43 S.E., 44 N.W., 47 N.E., S.E., 50 N.E., 51 N.W. **Staffordshire,** 16 N.E., 17 S.E., 19 S.W., 20 N.E. **Wiltshire,** 8 S.E., 10 N.E., 15 N.W., S.W., S.E., 20 N.E., S.E., 22 N.E., S.W., 27 N.E., S.E., 28 S.W., 29 S.W., S.E., 35 S.E., 36 N.E., 37 S.W., 42 N.E., S.W., S.E., 43 S.E., 48 N.E. 1*s. each.*

25-inch—Parish Maps:—

ENGLAND AND WALES (revision):—**Bedfordshire,** XXVIII. 7, 8, 11, 12; XXIX. 5, 6, 7, 8, 9, 10, 11, 12; XXXII. 3, 4, 7, 8, 9, 11, 14, 15; XXXIII. 13; XXXIV. 6, 7, 10. **Carnarvonshire,** XIX. 10; XXI. 5; XXIX. 10; XXXIV. 8, 12, 13; XXXV. 13; XL. 7; XLI. 6; XLIII. 7, 11, 15, 16; XLIV. 2, 3, 4, 5, 10, 16; XLVI. 6, 9, 10. **Cumberland,** III. 2, 3, 4, 8, 12, 15, 16; IV. 9, 10, 13, 14; VIII. 1, 2, 3, 5, 7, 9, 14; XII. 5, 8, 9, 10, 11, 13, 14; XIII. 5, 9; XV. 11; XVI. 7, 10, 12, 13, 14, 15, 16; XVII. 7, 8, 10, 11, 13, 14; XVIII. 3, 5, 11, 12; XXII. 3, 6, 11, 12; XXIII. 1, 2, 5, 6, 9, 10, 11, 12, 15, 16; XXIV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15. **Derbyshire,** XLV. 13; XLVI. 9, 14; XLVIII. 2, 3, 4, 6, 7, 8, 9, 11, 12; XLIX. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15; L. 7, 11, 12, 15, 16; LI. 2; LVI. 9, 11. **Glamorganshire,** VI. 15; XII. 1, 4; XIII. 5, 13; XIX. 16; XX. 1, 5, 9, 13; XXIX. 6, 9, 10, 14; XXXVIII. 1, 5, 9, 13; XLIII. 8. **Merionethshire,** I. 14, 15; III. 15, 16; IV. 10, 14; VI. 10; VII. 2, 4, 8, 12, 15; VIII. 1, 9; XI. 6, 11, 12, 13, 15; XII. 1, 3, 5, 9, 10, 13, 14, 15, 16; XIII. 3, 7, 8, 10, 11, 12, 13, 14; XIV. 1, 5,

6, 11; XVIII. 12, 16; XIX. 1, 2, 3, 4, 5, 9, 10, 14; XX. 1, 3, 5, 6, 7, 9, 10, 13, 14, 15; XXVI. 3, 6; XXVII. 1, 2, 3, 5. **Monmouthshire, I.** 6, 10, 15; III. 1, 2, 3, 4 (6 and 10), 7, 11; X. 15; XVI. 4; XVII. 5, 13; XXII. 1, 5, 9, 13; XXVII. 6, 9, 10, 14; XXXIII. 1, 5, 6, 9, 10, 13, 14; XXXVII. 8; XXXVIII. 1. **Northamptonshire, I.** 8, 11, 12, 15, 16; II. 4, 6, 7, 8, 10, 13; III. 1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16; IV. 1, 5, 6, 10, 14; V. 15, 16; VI. 3, 7, 10, 11, 16; VII. 1, 3, 7, 8, 12, 16; VIII. 1, 2, 4, 5, 6, 8, 9, 10, 13; IX. 2, 5; X. 11, 12; XI. 7, 8; XII. 7, 9, 10, 11; XIII. 2, 5, 16; XIV. 1; XV. 14; XVII. 7; XVIII. 4; XIX. 5; XXIV. 16; XXV. 3; XXVI. 6; XXXIII. 5; XXXVIII. 13, 14, 15; XXXIX. 3; XLIV. 8, 12; XLV. 3. **Nottinghamshire,** XXXVII. 2, 7, 14; XXXVIII. 9; XLI. 2, 12; XLII. 3, 4, 7, 8, 9, 11, 13, 14, 15, 16; XLV. 11, 12, 15; XLIX. 2, 3, 4, 7, 8, 11, 12, 15, 16; LII. 4. **Wiltshire,** XXV. 13, 14, 15; XXXII. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16; XXXIII. 1, 13; XXXVIII. 2, 3, 9, 10; XXXIX. 1, 2, 3, 5, 6, 7, 11, 12, 13, 14, 15, 16; XL. 6, 9, 10, 11; XLV. 2, 6; XLVI. 2, 5; XLVII. 13, 14, 15; XLVIII. 13, 14; LI. 7, 12; LII. 3, 8, 9; LIII. 2, 9, 11, 12, 13; LIV. 1, 2; LV. 2, 9, 11; LX. 6, 11, 12, 14, 15, 16. 3*s. each.*

Guernsey

6-inch :—Complete in 11 quarter sheets. 1*s. each.*

(***E. Stanford, London Agent.***)

ASIA.

China. **Waeber.**

Map of North-Eastern China. Scale 1 : 1,355,000 or 18·5 stat. miles to an inch. Ch. Waeber, 1900. Second edition. Chief depôt : L. Friederichsen & Co., Hamburg. 4 sheets.

Apart from the addition of railways and the boundaries of the British, German, and Russian territories of Wei-hai-wei, Kiao Chou, and Port Arthur, little alteration has been made to this map, which was first published in 1893.

Tonking. **Bureau Topographique des Troupes de l'Indo-Chine.**

Carte du Tonkin. Scale 1 : 500,000 or 7·9 stat. miles to an inch. Sheets : Cao Bang, Hanoi, Laokay, Luang Prabang. Bureau Topographique des Troupes de l'Indo-Chine, Hanoi, 1899. *Price* $0.60 *each.*

This map of Tonking, in four sheets, has been prepared at the Bureau Topographique des Troupes de l'Indo-Chine at Hanoi, under the superintendence of Commandant Lebreton. It is roughly lithographed in colours, but contains a good deal of useful information, especially with regard to means of communication.

AFRICA.

Africa. **Johnston**

Map of Africa. Scale 1 : 11,800,800 or 186·25 stat. miles to an inch. By G. H. Johnston, F.R.G.S. W. & A. K. Johnston, Edinburgh and London, 1901. *Price* 1*s.* (*coloured*). *Presented by the Publishers.*

Egypt. **Petermanns Geographische Mitteilungen.**

Originalkarte des Niltals von Farschût bis Kom-Ombo, Ober-Ägypten. Nach den Originalkarten des ägyptischen Ministeriums der öffentlichen Arbeiten in 1 : 100,000 or 1·6 stat. mile to an inch, und nach Prof. Dr. G. Schweinfurth's Aufnahmen im Jahre 1882, reduziert auf den Masstab 1 : 400,000 or 6·3 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 1. Gotha : Justus Perthes, 1901. *Presented by the Publisher.*

German East Africa. **Böhler.**

Ost-Usambara, 1897–99. Trigonometrisch und topographisch aufgenommen, berechnet und gezeichnet durch H. Böhler. Scale 1 : 50,000 or 0·8 stat. mile to an inch. D. Reimer (Ernst Vohsen), Berlin, 1901.

This is a map of a part of the Usambara district of German East Africa on the comparatively large scale of 1 : 50,000, based principally upon the trigonometrical and tacheometrical surveys of Messrs. Lammerl and Röpke. Contour-lines at intervals of 50 and 100 metres are laid down from 200 to 1200 metres in altitude, in addition to which the relief is indicated by brown shading. Coffee plantations are coloured red, and by means of other colours and symbols a considerable amount of additional information is given with regard to the agricultural and physical conditions of the district, European stations, and native villages. The map includes an area of about 220 square stat. miles.

South Africa. **Wood and Ortlepp.**

Map of Cape Colony and part of Bechuanaland. ("Briton or Boer.") Scale 1 : 1,267,200 or 20 stat. miles to an inch. Wood and Ortlepp, Cape Town and Johannesburg, 1900. 3 sheets. *Presented by Messrs. G. Philip & Son.*

The two previous sections of this map, which have already appeared, include the Orange River Colony, the Transvaal, Southern Rhodesia, and Eastern Bechuanaland; but now Messrs. Wood and Ortlepp have published a third section in three sheets, which contains the Cape Colony, the remaining portion of Bechuanaland, and a part of German South-West Africa. It is printed in colours, the hills being shown by a system of brown horizontal line work, the water blue, and names in black.

AMERICA.

Argentine Republic. **Comision Argentina de Limites con Bolivia.**

Plano Topografico de la Region Norte Argentina Limitrofe con Bolivia. Scale 1 : 575,000 or 9·7 stat. miles to an inch. Comision Argentina de Limites con Bolivia. *Presented by the Comision Argentina de Limites con Bolivia.*

The area included in this map lies between S. lat. 21° 27′ and 23° 27′, and from the upper waters of the Rio Pilcomayo to 67° 16′ W. long. It is a photographic reduction of a map based on the surveys made by the Argentine Commission in connection with the boundary question between the Argentine Republic and Bolivia.

Chile. **Martin.**

Karte von Llanquihue und Chiloe. Scale 1 : 1,200,000 or 18·9 stat. miles to an inch. Von C. Martin. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 2. Gotha : Justus Perthes, 1901. *Presented by the Publisher.*

PACIFIC OCEAN.

Pacific Ocean. **Bartholomew.**

Bartholomew's Chart of Oceania and the Pacific Ocean, on Mercator's Projection. J. Bartholomew & Co., Edinburgh, 1901. *Price* 3*s. Presented by the Publishers.*

The limits of this chart in latitude and longitude are approximately 52° N. to 47° S. and 100° E. to 70° W. It thus includes parts of Eastern China and Russia, the whole of Japan, the East Indian Archipelago, Australia, New Zealand, and considerable portions of North and South America. Ocean currents, steamer lines, and telegraphs are shown, and some soundings are laid down. Political boundaries are coloured, and in the case of the Pacific islands, it is clearly stated to which European nation they belong.

GENERAL.

World. **Pelet.**

Atlas des Colonies Françaises. Dressé par ordre du Ministère des Colonies par Paul Pelet. Paris : Armand Colin & Cie. Livraison 4. *Price* 3 *francs.*

This fourth part of Pelet's atlas of the French colonies, which is being issued by authority of the Minister of War, contains maps Nos. 18 and 19, Madagascar, Central Part, and No. 23, French possessions in India, and French Guiana. There is also given, in the same folio, eight pages of geographical and statistical information concerning French West Africa, followed by a useful bibliography of those regions. The maps, like the others belonging to this atlas, are clearly drawn and printed in colours.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, November and December, 1900. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
442 m =	0·5	England, south coast :—Lizard head to Start point. 2*s.*
1403 m =	3·0	Scotland, west coast :—Loch Ryan.
	6·8	Stranraer harbour. 1*s.* 6*d.*
3146 m =	6·7	Scotland, west coast :—Loch Ewe. 2*s.* 6*d.*
3150 m =	1·4	Norway, south-east coast :—Lillesand to Narestö. 2*s.* 6*d.*
3151 m =	1·4	Norway, south-east coast :—Narestö to Portor. 2*s.* 6*d.*
3149 m =	5·0	Balearic islands :—Alcudia bay. 1*s.* 6*d.*
3156 m =	0·24	Brazil :—Cape Tromba Grande to Itacolomis reef. 2*s.* 6*d.*

3157 m = 0·24 Brazil:—Itacolomis reef to Rio Doce. 2*s.* 6*d.*
2870 m = 0·5 British Columbia:—Toba, Bute, and Loughborough inlets. 2*s.* 6*d.*
3138 m = Var. Anchorages in South-east Alaska:—Klawak inlet and approach, Cape Chacon, Tamgas harbour, Mary island anchorage and Custom House cove. 2*s.* 6*d.*
1147 d = 3·8 Africa, west coast:—Cape Verde to Cape St. Ann. 2*s.* 6*d.*
3147 m = 3·95 Africa, west coast:—Entrance to Sierra Leone river. 2*s.* 6*d.*
3139 d = 3·7 Africa, west coast:—Cape St. Ann to Cape Three Points. 3*s.*
3145 m = 3·9 Andaman islands:—Port Anson. 2*s.* 6*d.*
3148 m = 0·72 Celebes, east coast:—Salabangka strait. 1*s.* 6*d.*
3126 m = 0·98 Anchorages in the Philippine islands:—Kasiguran bay. 1*s.*
389 m = 10 0 China, east coast:—Shanghai harbour. 2*s.* 6*d.*
2357 m = 6·0 China, east coast:—Ching Wang Tao road. 1*s.* 6*d.*
3152 m = 2·9 Australia, west coast:—Ashburton road. 2*s.*
2204 m = 2·4 Anchorages on the north coast of New Guinea:—Angriffs haven. 1*s.*
3137 m = 2·8 Society islands:—Port Phaëton and approaches. 1*s.* 6*d.*
2082 Africa, south coast, Table bay to Cape Agulhas:—Plan added, Hout bay. 2*s.* 6*d.*
671 Plans on the east coast of Africa:—Plan added, Bander Alula anchorage. New plans:—Obiat anchorage, Mogdishu, Merka anchorage, Brawa anchorage, Athelet anchorages.
3003 Japan:—New plan, Sakata harbour.
(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1403	Loch Ryan.	New plan. Loch Ryan	1403
904	Abrolhis rocks.	New chart. Itacolomis reef to Rio Doce	3157
2110	Plan of Mary island anchorage on this sheet.	New plan. Mary island anchorage and Custom House cove	3138
635	Hout bay.	New plan. Hout bay	2082
1256	Plan of Shallow bay on this chart.	New Plan. Ching Wang Tao road	2357
389	Shanghai harbour.	New plan. Shanghai harbour	389
1055	Plan of Ashburton road on this chart.	New plan. Ashburton road	3152

Charts that have received Important Corrections.

No. 2598, The World:—Magnetic variation. 1170B, England, west coast:—Great Ormes head to Liverpool. 1951, England, west coast:—Liverpool bay. 2114, Baltic entrance:—The Kattegat. 2300, Gulf of Bothnia, sheet 5. 185, Germany:—Port Swinemunde. 696, Baltic:—Kiel harbour. 2643, France, west coast:—Raz de Sein to Goulven. 2690, France, west coast:—Brest roadstead. 798, France, west coast:—Douarnenez bay and approach. 2713, Adriatic sea:—Curzola to Cattaro. 1590, Adriatic:—Durazzo bay. 1463, Adriatic sea:—Ports and anchorages in Dalmatia and Albania. 2070, Ægean sea:—Saloniki bay. 1941, Gulf of St. Lawrence:—Cocagne harbour. 2600, West Indies:—San Domingo to Dominica. 1801, South America, east coast:—Trinidad to Surinam. 1142, Brazil:—Port of Cape Frio. 1673, Brazil:—Port Angra dos Reis and Jacuacanga bay. 2139, Central America:—Port Nuevo. 2816, Central America:—Parid and Palenque anchorages. 2531, United States, west coast:—Cape Mendocino to Vancouver island. 611, Vancouver island:—Griffin bay. 602, Vancouver island:—Roche harbour. 2689, British Columbia:—Haro and Rosario straits. 2840, British Columbia:—Haro strait and Middle channel. 580, British Columbia:—Strait of Georgia, sheet 2. 1365, Africa, west coast:—Baffu bay to Grand Berebi. 2768A, Africa, west coast:—Badagri to Cape Formosa. 2768B, Africa, west coast:—Cape Coast Castle to Badagri. 636, Africa, south coast:—Cape of Good Hope and False bay. 1849, Africa, south coast:—Simons bay. 1577, Africa, east coast:—Lower Zambezi river. 143, Red sea:—Jebel Teir to Perim island. 2837B, Persian gulf, northern portion. 1235, Persian gulf:—Mouth of the Euphrates. 941B, Eastern Archipelago, western portion. 2637,

Strait of Makassar, south part. 2660B, China sea, southern portion. 1961, China sea:—Pescadores islands. 2347, Japan:—Nipon, Kiusiu, and Shikoku. 1203. Japan:—Uraga harbour. 1700, Australia, west coast:—Fremantle harbour and Gage roads. 134, South Pacific:—Anchorages in New Hebrides.
(*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for January, 1901, and of the North Pacific Ocean for February, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

China. **Jack.**

Thirty Photographs taken in Sechuen by Dr. R. L. Jack, 1900. *Presented by Dr. R. L. Jack.*

These photographs form a welcome addition to those presented by Dr. R. L. Jack some months ago, and which have already been noticed in the *Journal*. As will be seen from the following titles, some of the subjects are especially interesting.

(1) Undersbot waterwheel (of bamboo) with bamboo buckets on rim for irrigating paddy-fields, Nan Ching Yih; (2) Iron urn at Tsing Yang Kung temple, Chengtu; (3) Roofed wooden bridge near Lung Chow; (4) Divisional dykes of the Kwang Ko irrigation works; (5) Bamboo rope suspension bridge; (6) Exterior of smelting works, Tung Ling Tse; (7) Chinese magistrate climbing a hill; (8) Camp of party at Tung Ling Tse, with Chinese escort; (9) Garden of the "Propitious Star Hotel," Pen Hsien; (10) Three-arched stone bridge, Han Ju Chow; (11) Roadway of bridge, Han Ju Chow; (12) Widows' memorial arch across the road, Han Ju Chow; (13) Ploughing in a rice-field with a water-buffalo; men raising water with Chinese foot-pump; (14) Chief idols of the temple of Kwang Ti; (15) Behind the main altar of the temple of Kwang Ti; (16) Garden of the Cantonese guildhall, An Hsien, showing ornamental pond; (17) Vertical bed of quartzite, Hwong Hsang Kow; (18) Bamboo bridge, 80 yards span, Shih Chuen; (19) Anchoring and straining gear of the Shih Chuen suspension bridge; (20) Rafting timber down the Fou Kiang from Lung An; (21) Entrance to the Cantonese guildhall, An Hsien; (22) A gorge of the Fou Kiang, below Ping Yi Pu; (23) Wayside inn, at 9000 feet elevation, between Lung An and Sungpan; (24) Snow-clad mountain of Hsueh Shan, which is crossed by the Sungpan-Lung An road; (25, 26) Interior of a room in the Mining Bureau, Chengtu; (27) Courtyard in the Mining Bureau, Chengtu; (28) General view at Tsing Yang Kung annual fair; (29) Chinese officials; (30) Dr. R. L. Jack, R. Lockhart Jack, J. Morris, and Chinese officials.

South Africa. **Melvill.**

Twenty-two Photographs of Scenes of Battles at Modder River, Magersfontein, Paardeberg, Kimberley, etc. By E. H. V. Melville, Esq., 1900. *Presented by E. H. V. Melville, Esq.*

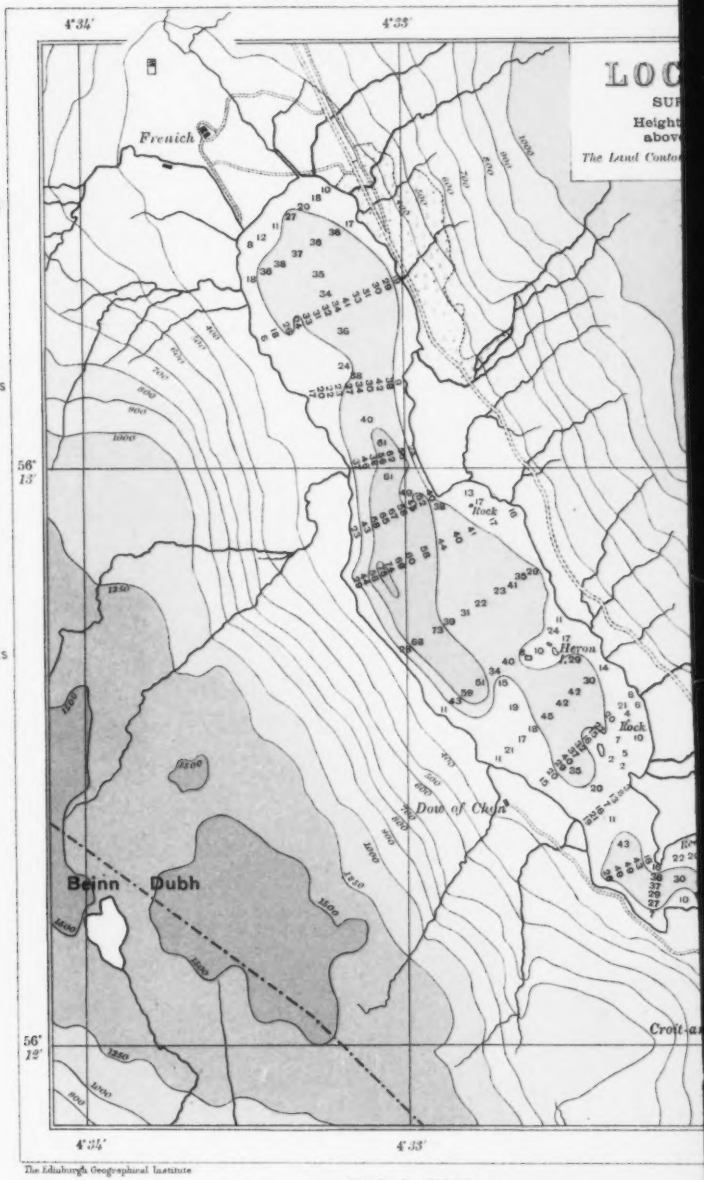
Apart from the special interest attached to these photographs, inasmuch as they represent the scenes of battles, and the graves of many of our brave soldiers who have fallen in South Africa, they serve well to illustrate the character of the country and the natural difficulties our troops have to contend with. They are remarkably well taken, and are accompanied by a sketch-map of the British graves at Paardeberg. The following is a list of their titles:—

Modder river.—(1) Modder river; (2) Modder river bridge; (3, 4) British graves. *Magersfontein.*—(5) Long Tom position, looking towards Modder river; (6) Tree where General Wauchope was killed; (7, 8) Boer trenches; (9) Graves of officers and men; (10) Trench. *Paardeberg.*—(11, 12, 13) British graves; (14) Camp, O.R.C. police; (15) Graves of six men of the Royal Canadian regiment; (16) Mrs. Cronje's shelter; (17) Cronje's camp. *Kimberley.*—(18) Search-light on Premier mine *débris* heap; (19) Conning tower; (20) Kimberley from Carter's ridge; (21) Premier mine, Wesselton; (22) Scholtz Nek.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

BATHYMETRICAL SURVEY OF THE SCOTTIS

By Sir JOHN MURRAY, K.C.B., LL.D., F.R.S., and FRED. P. PULL



HEIGHTS IN FEET

FEET	METRES
1500	457·2
1250	381·2
1000	304·8
800	243·8
600	182·9
400	121·9

DEPTHS IN FEET

FEET	METRES
25	7·6
50	15·2
75	22·9

The Edinburgh Geographical Institute

Scale 1 : 21120 3 INCHES TO 1 MILE

0·21 KILOMETRE = 1 CENTIMETRE

Published by the Royal Geographical Society.

COTTISH LOCHS.

P. PULLAR, F.R.G.S.

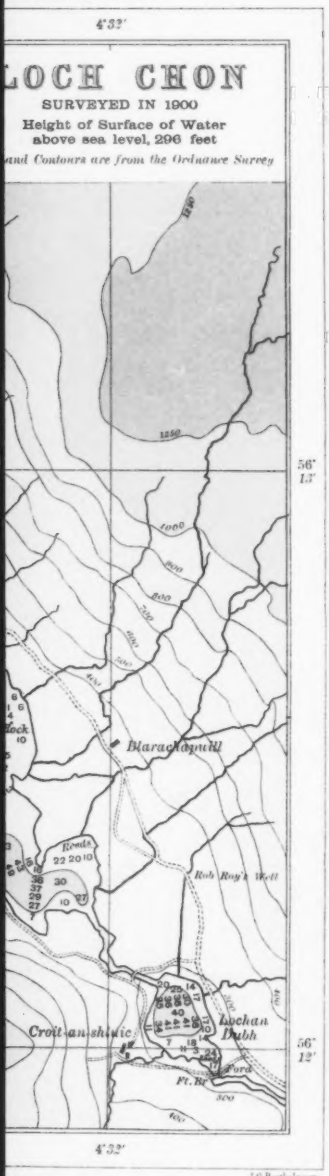
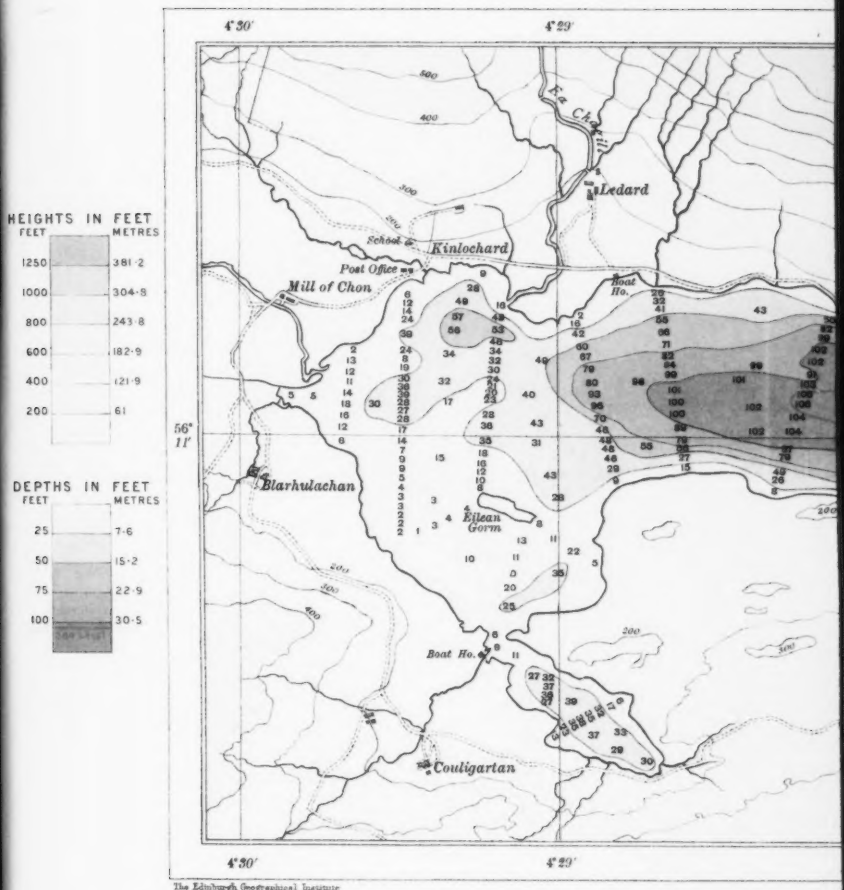


PLATE II

BATH

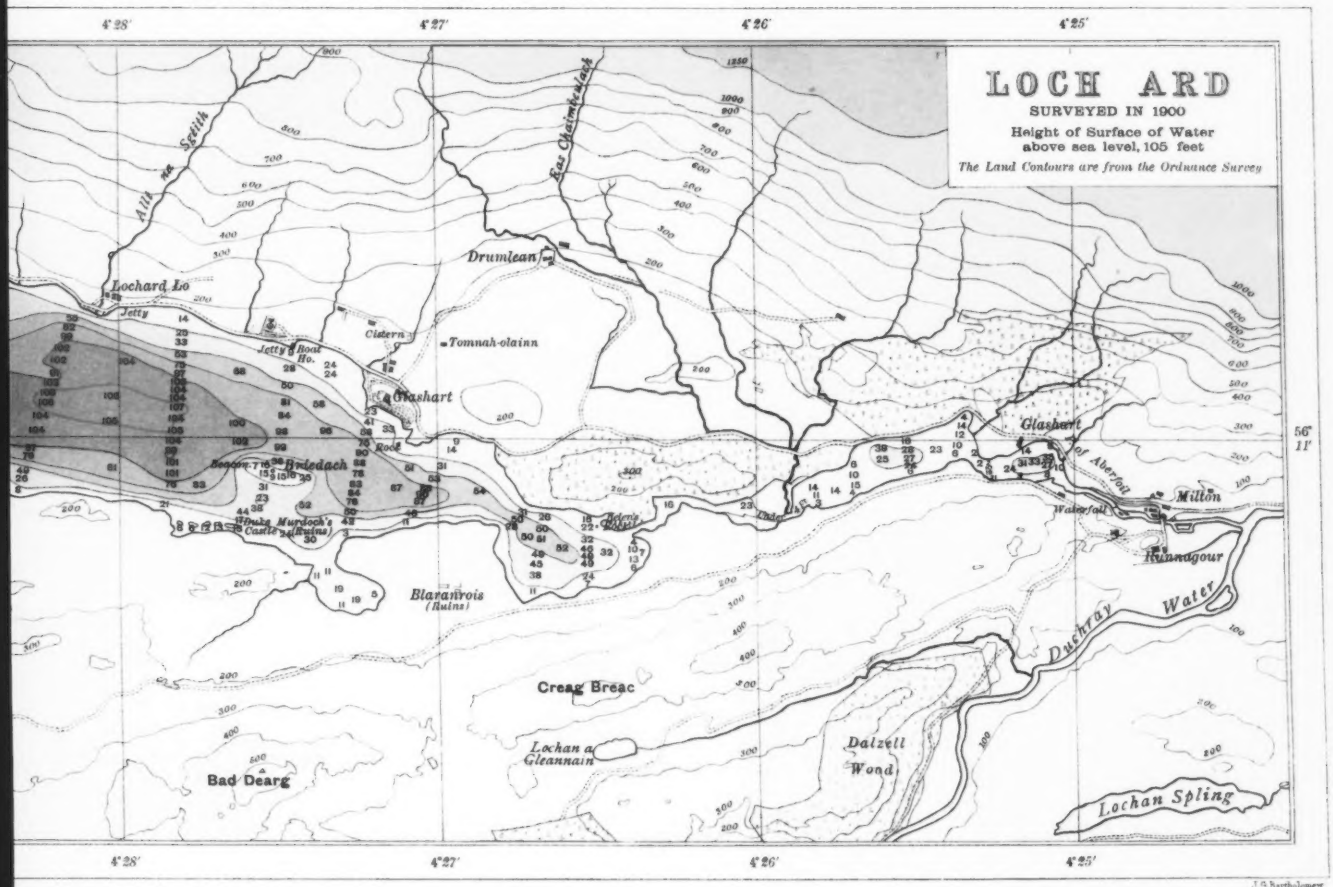
By



The Edinburgh Geographical Institute

BATHYMETRICAL SURVEY OF THE SCOTTISH LOCHS.

By SIR JOHN MURRAY, K.C.B., LL.D., F.R.S., AND FRED. P. PULLAR, F.R.G.S.



Scale 1 : 21120 3 INCHES TO 1 MILE Mile 1

Kilometres 1·61

0·21 KILOMETRE = 1 CENTIMETRE

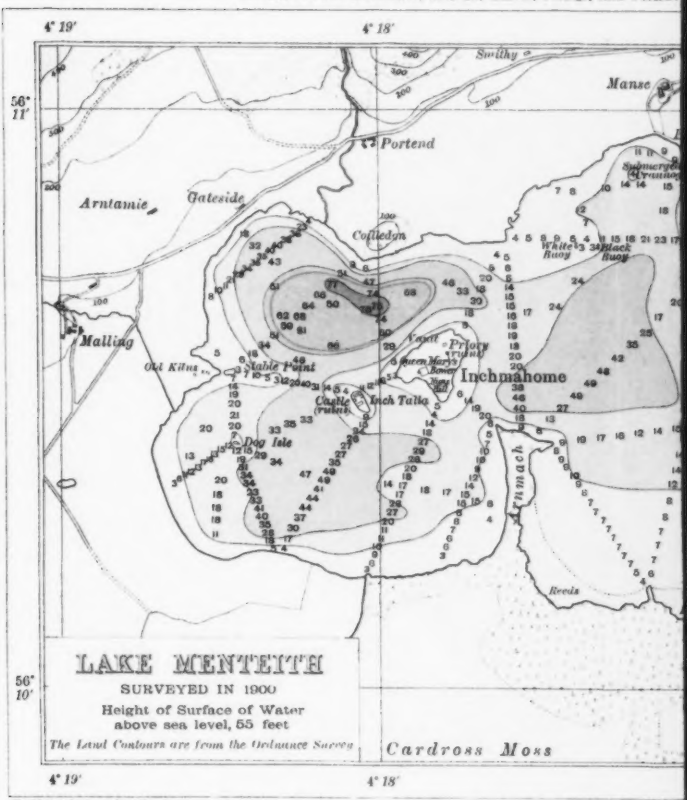
J. G. Bartholomew

Published by the Royal Geographical Society

PLATE III

BATHYMETRICAL SURVEY OF THE S

BY SIR JOHN MURRAY, K.C.B., LL.D., F.R.S., AND FRED.



HEIGHTS IN FEET

FEET	METRES
400	121·9
200	61

DEPTHS IN FEET

FEET	METRES
10	3·05
25	7·6
50	15·2
75	22·9
Sea Level	

The Edinburgh Geographical Institute

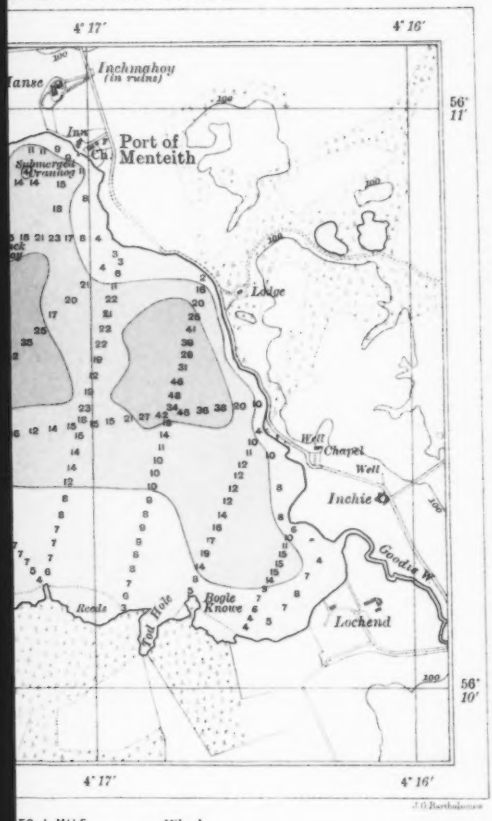
Scale 1 : 21120 3 INCHES TO 1 MIL

0·21 KILOMETRE = 1 CENTIMETRE

Published by the Royal Geographical

HE SCOTTISH LOCHS.

D FRED. P. PULLAR, F.R.G.S.



TO 1 MILE Mile 1

Kilometres 1·61

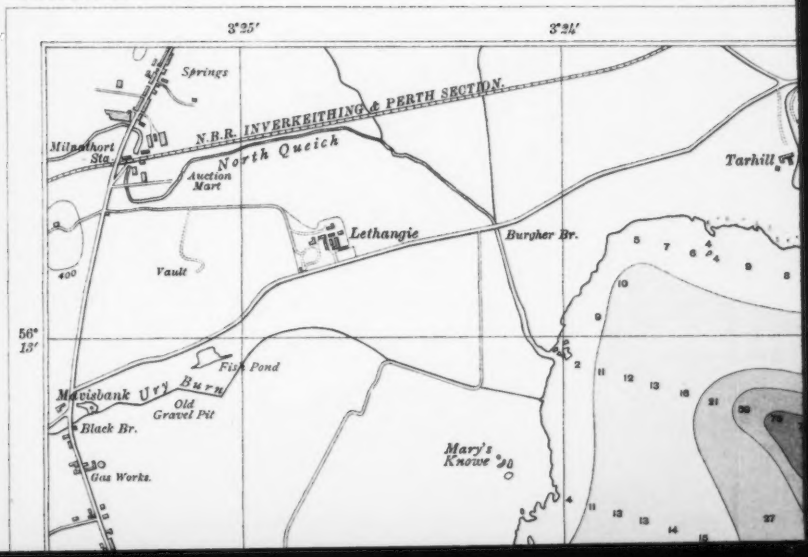
METRE

phical Society.

BATHYMETRIC

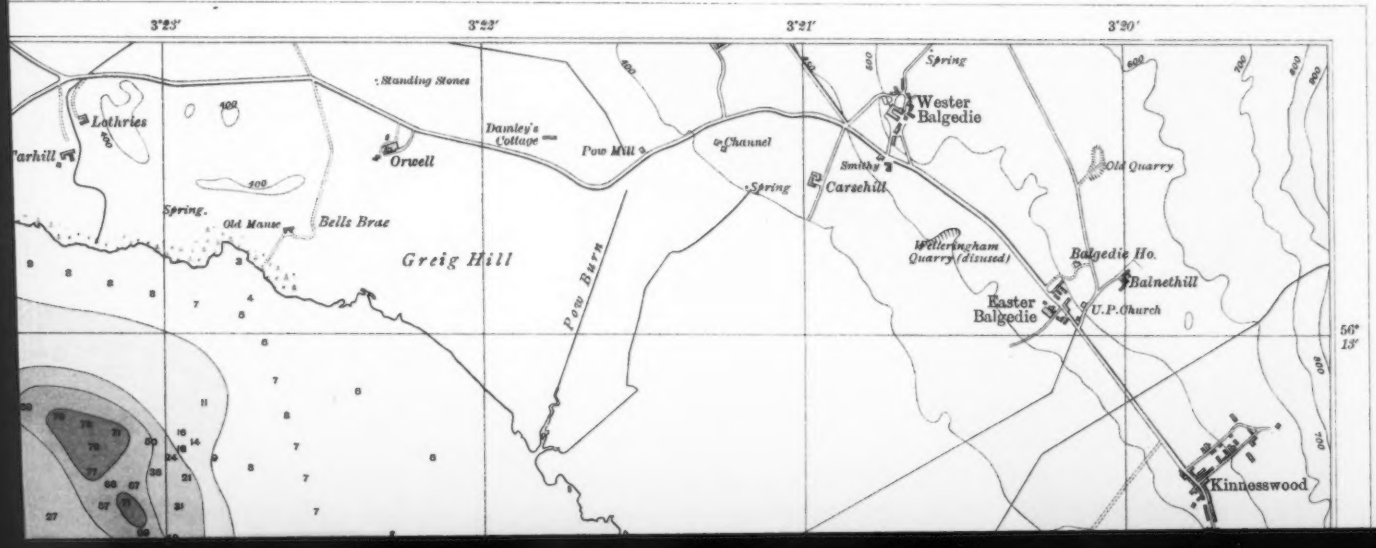
PLATE IV

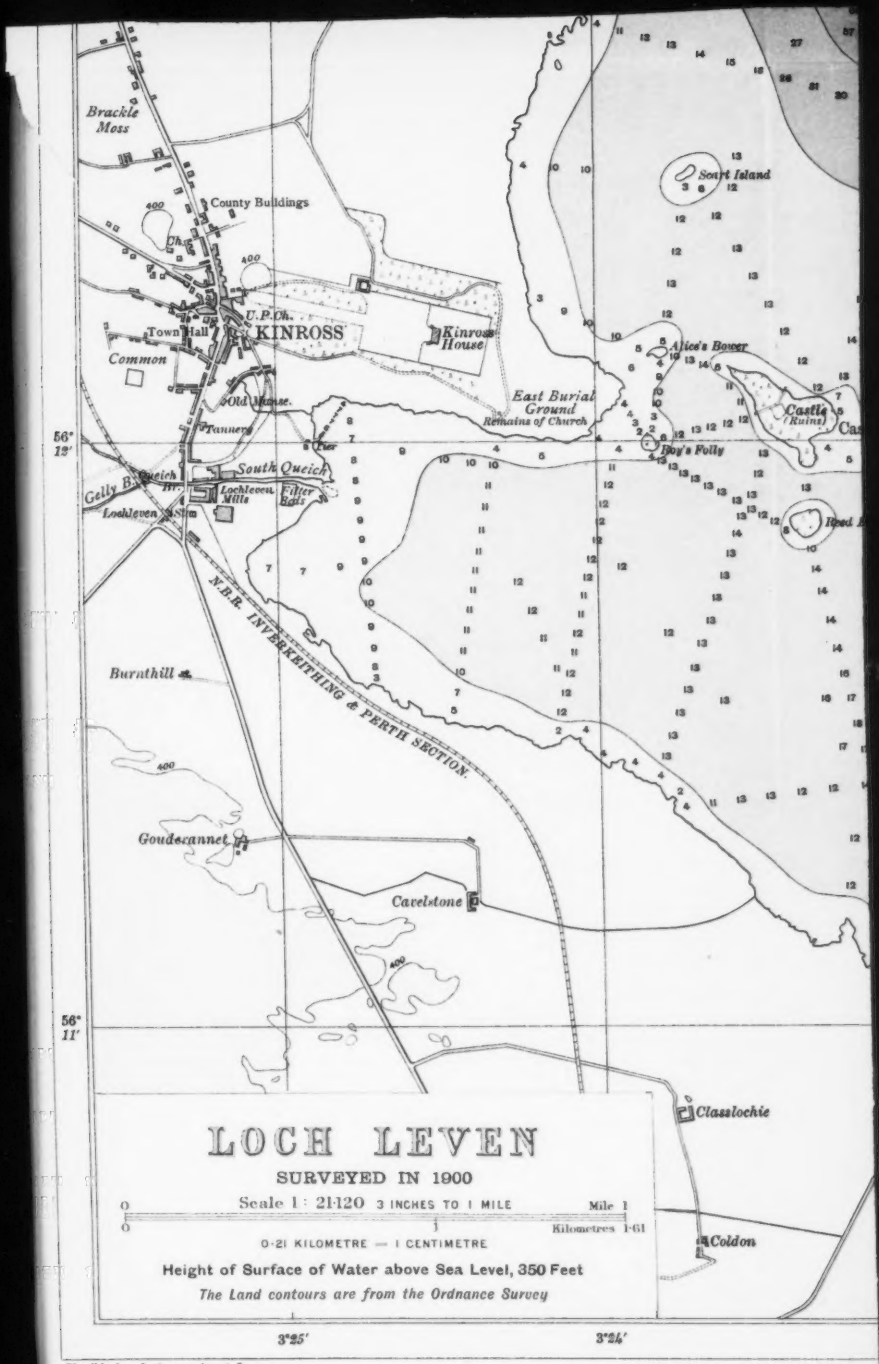
BY SIR JOHN M



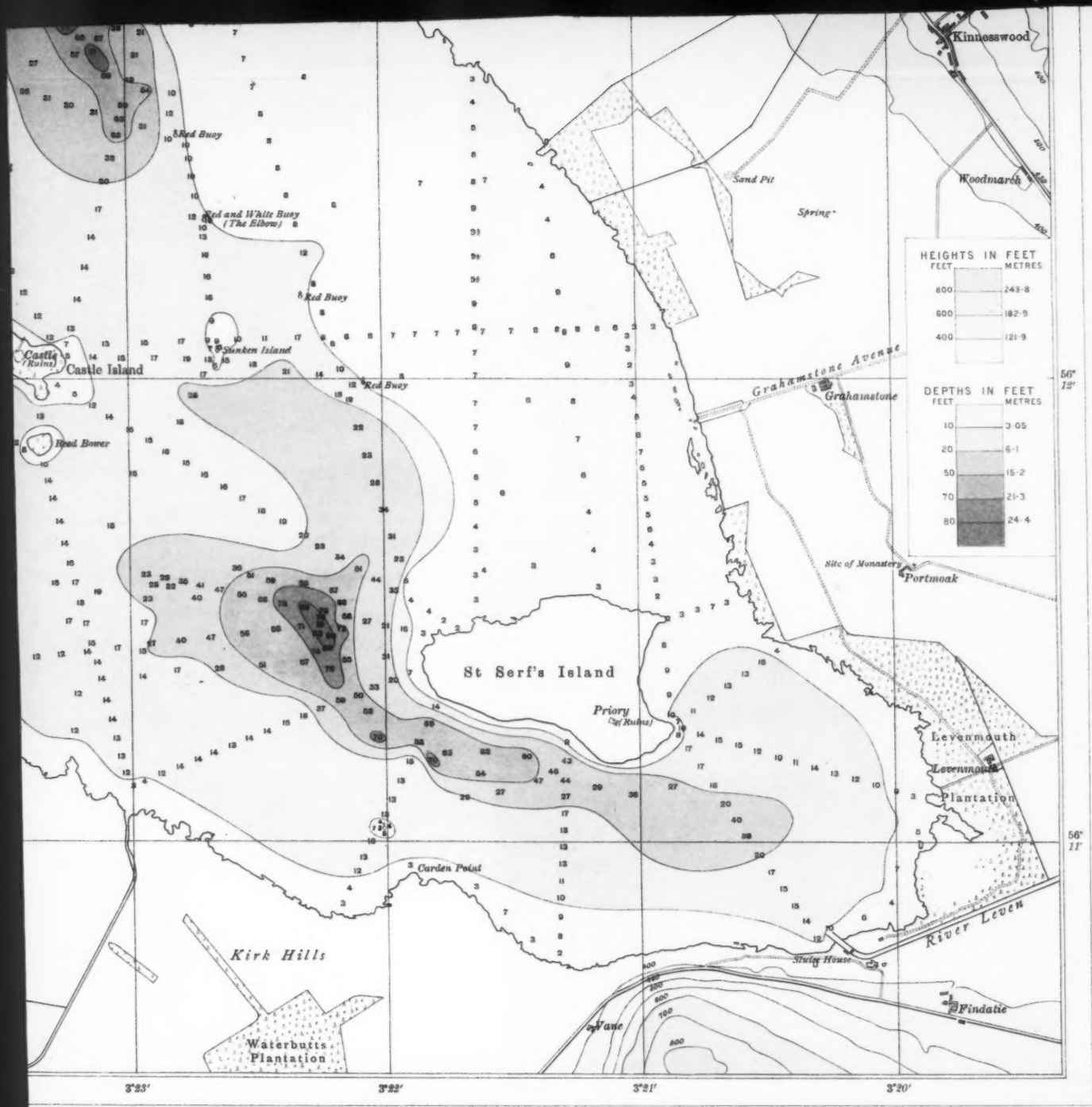
TRICAL SURVEY OF THE SCOTTISH LOCHS.

OHN MURRAY, K.C.B., LL.D., F.R.S., AND FRED. P. PULLAR, F.R.G.S.





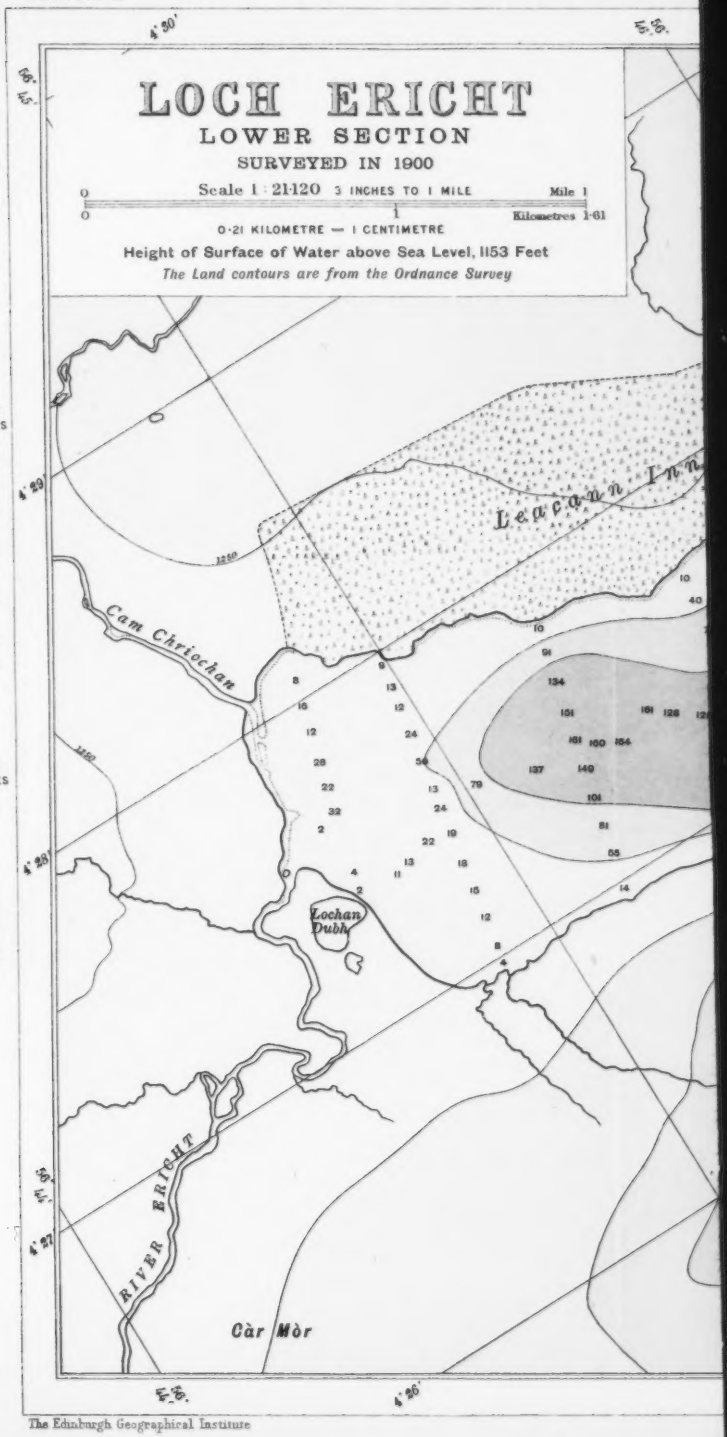
The Edinburgh Geographical Institute



J.G.Bartholomew

Published by the Royal Geographical Society

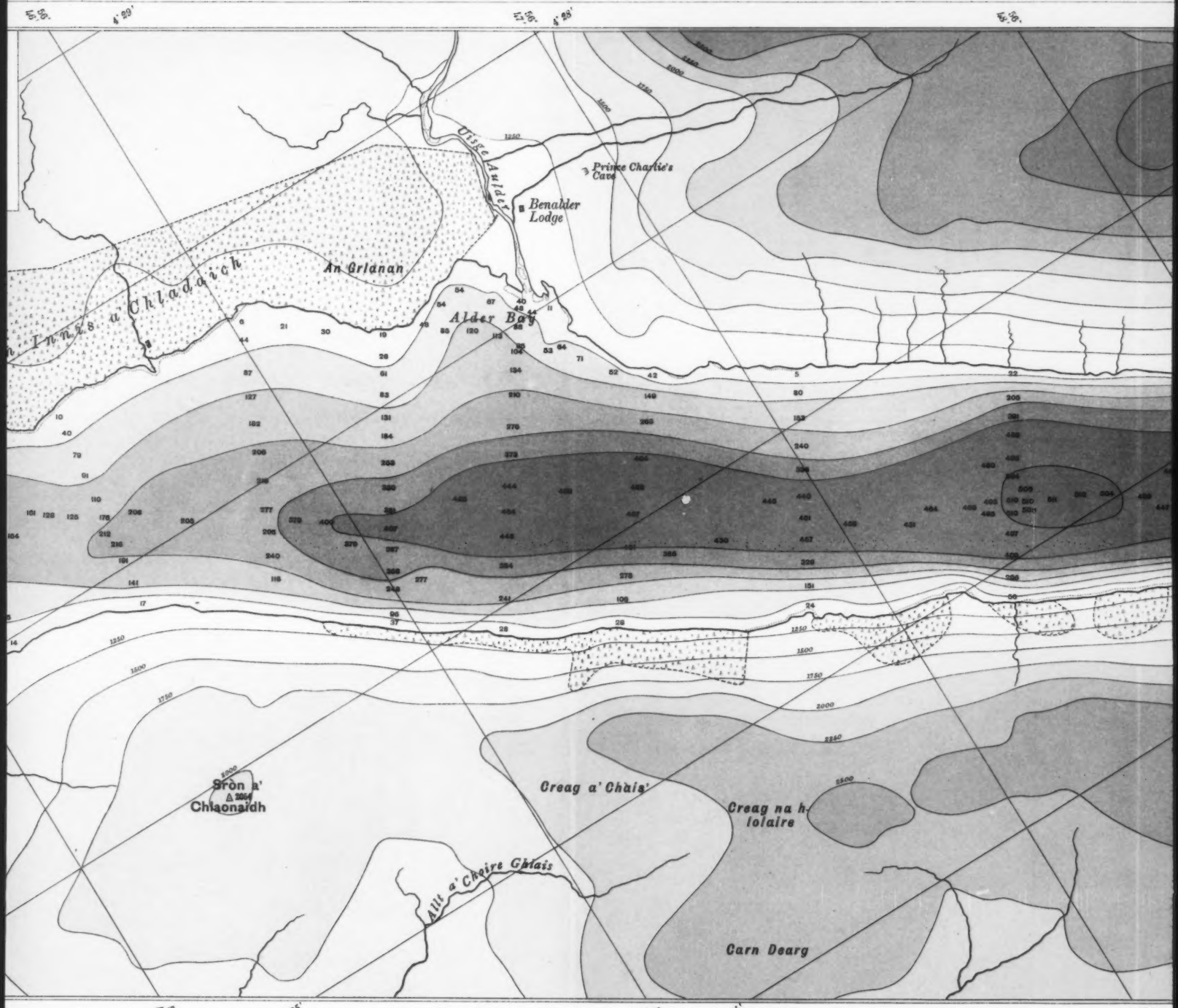
PLATE I



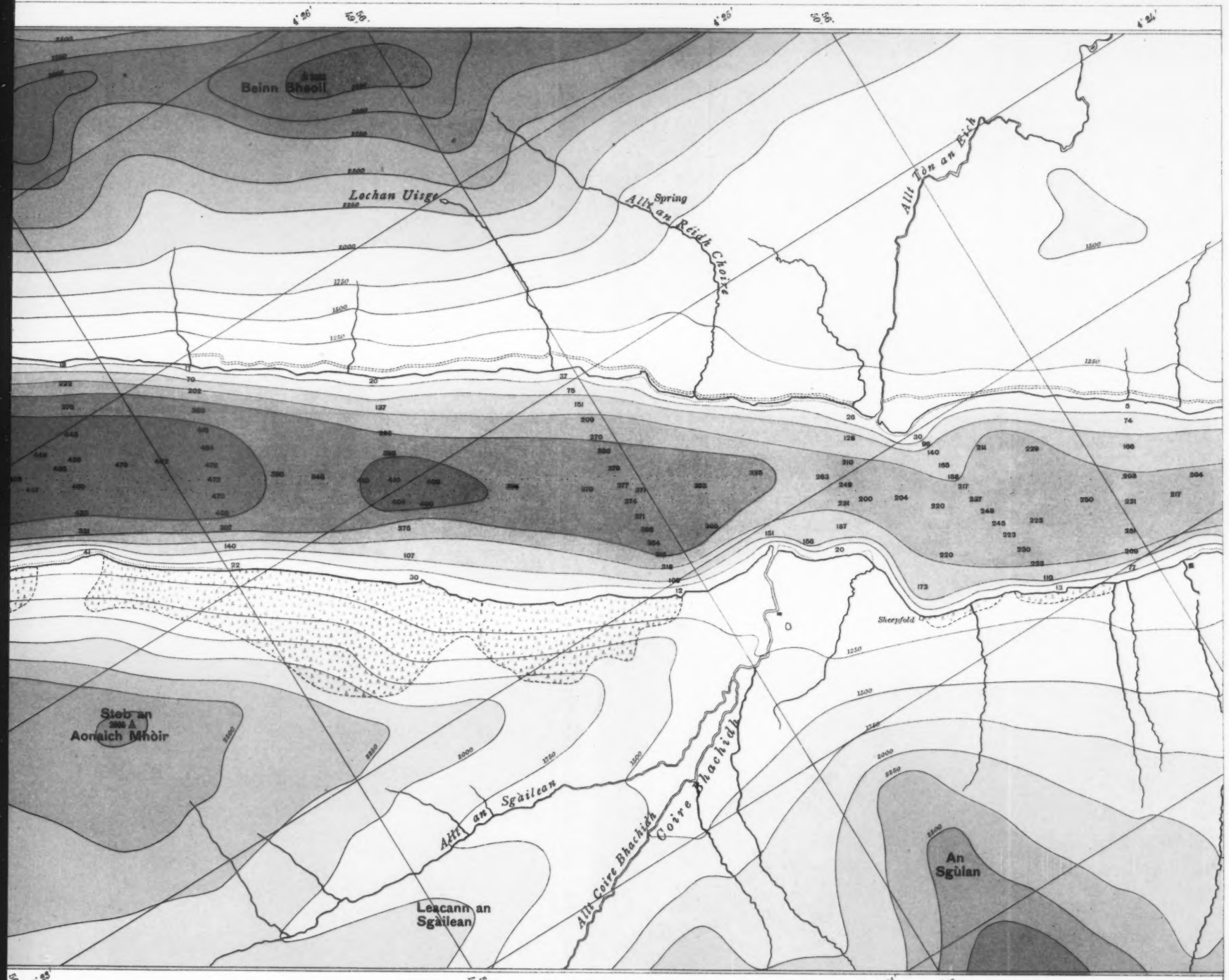
The Edinburgh Geographical Institute

Bathymetrical Survey of the Scot

By Sir John Murray, K.C.B., LL.D., F.R.S., and Fred. P. Pu

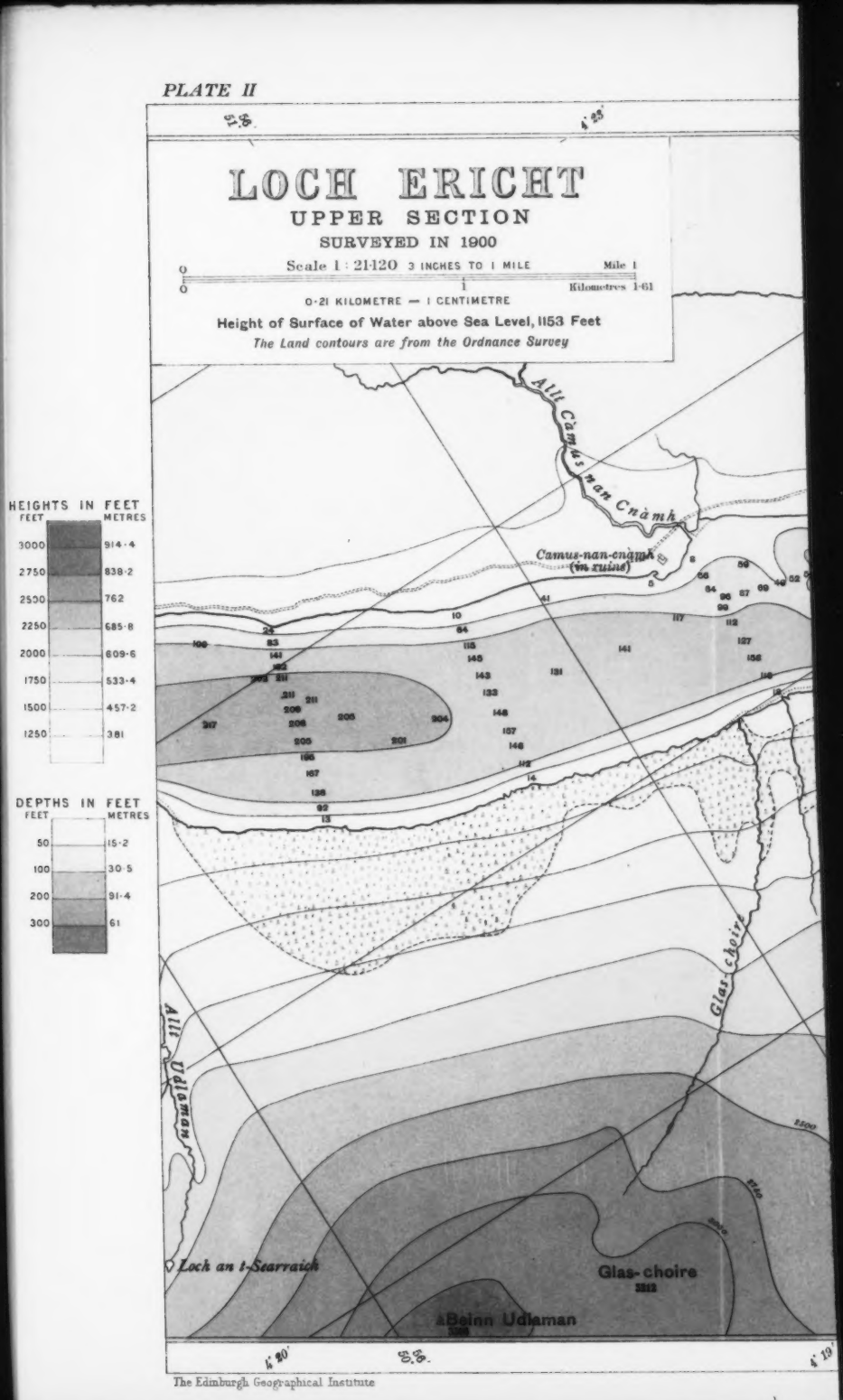


Published by the Royal Geographical Society.



J. G. Bartholomew

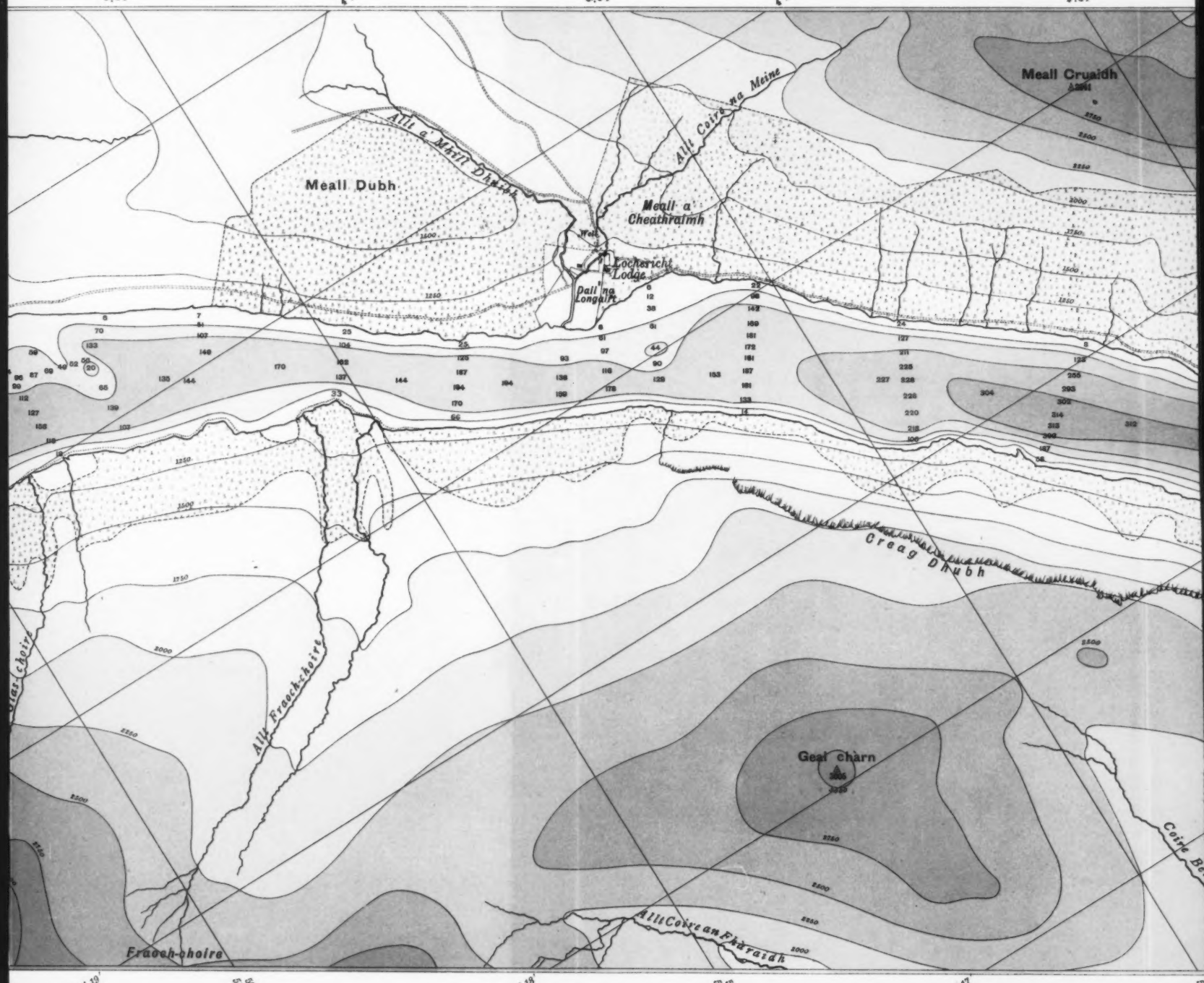
PLATE II



The Edinburgh Geographical Institute

BATHYMETRICAL SURVEY OF THE SCOTTIS

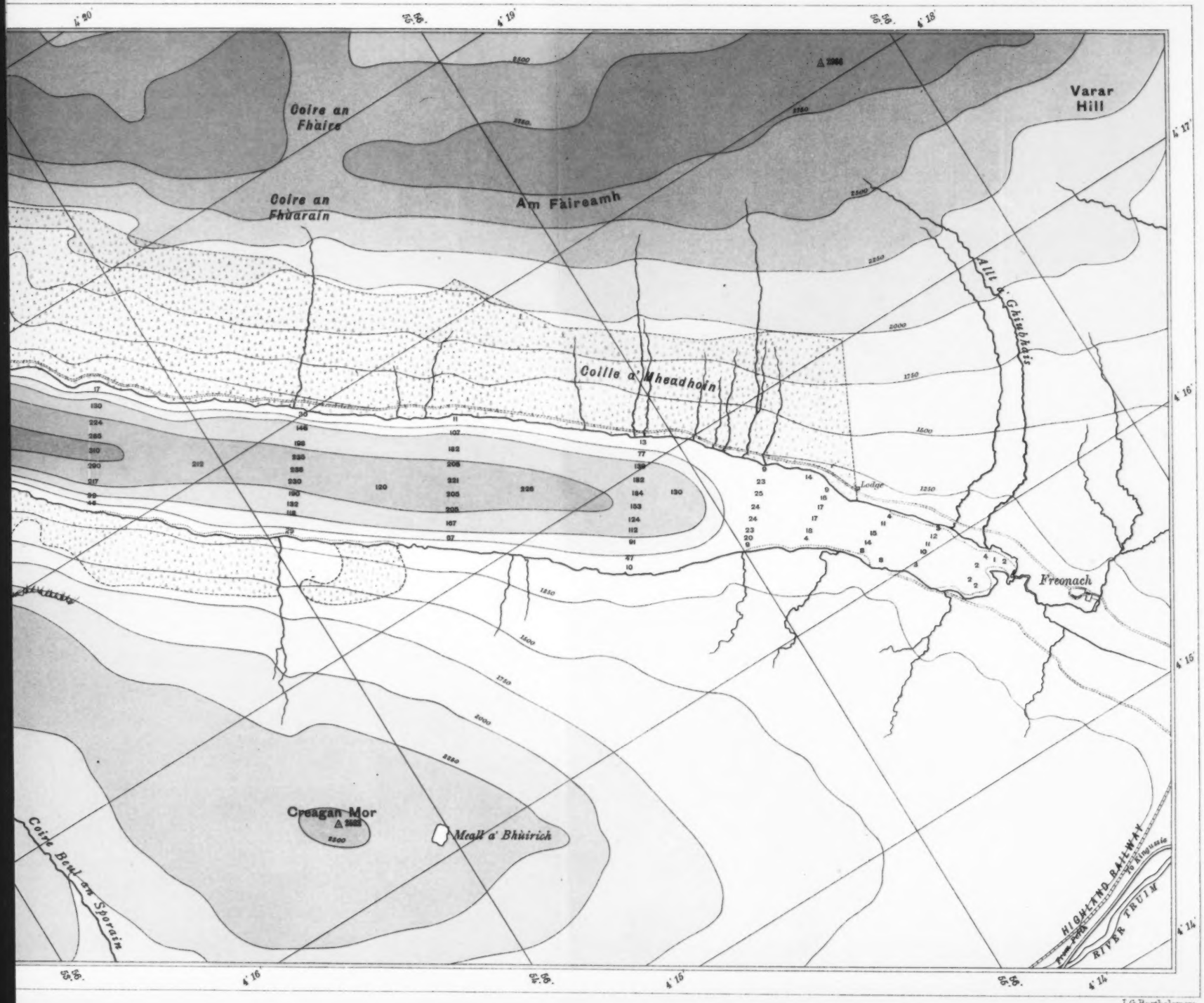
BY SIR JOHN MURRAY, K.C.B., LL.D., F.R.S., AND FRED. P. PULLAR



Published by the Royal Geographical Society.

...TTISH LOCHS.

...ULLAR, F.R.G.S.

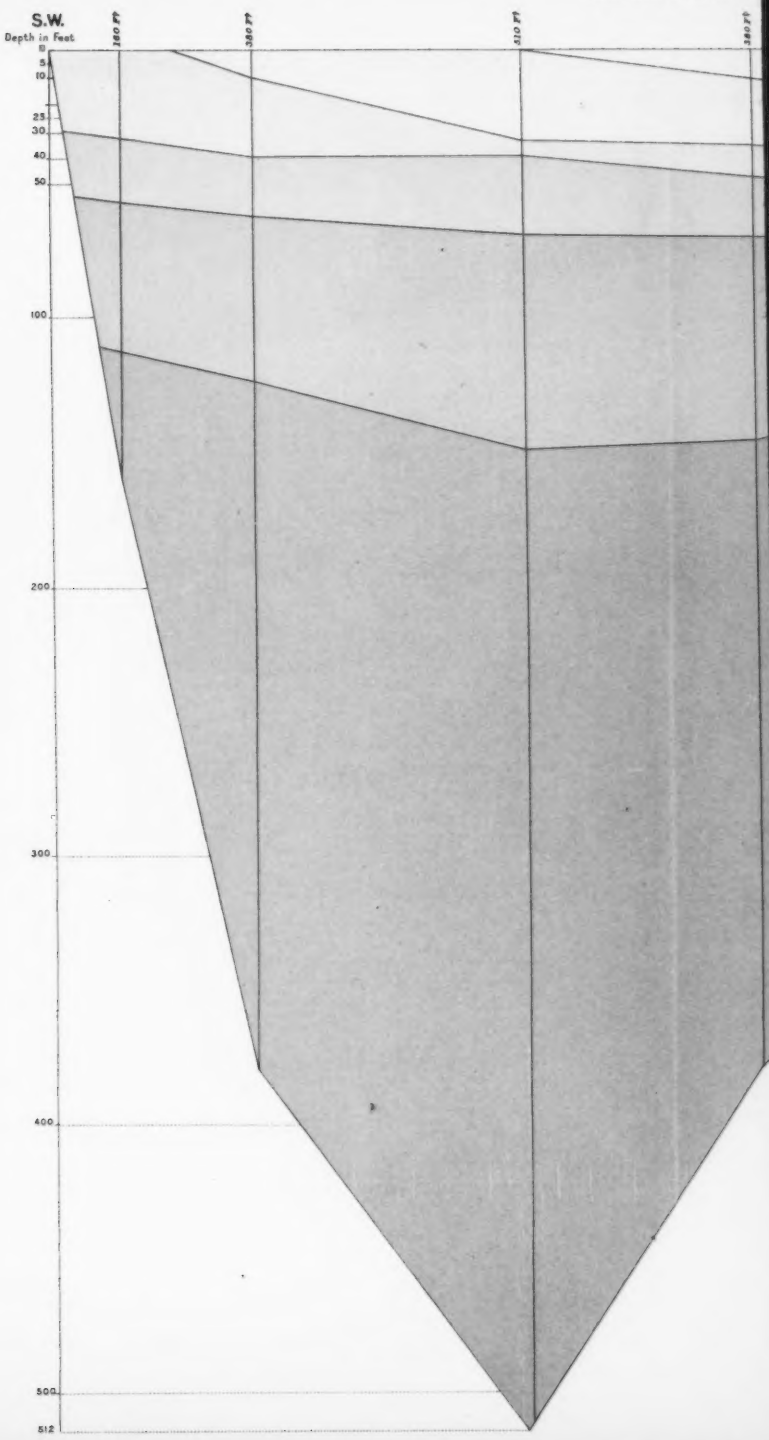


J. G. Bartholomew

PLATE III

BATHYMETRIC

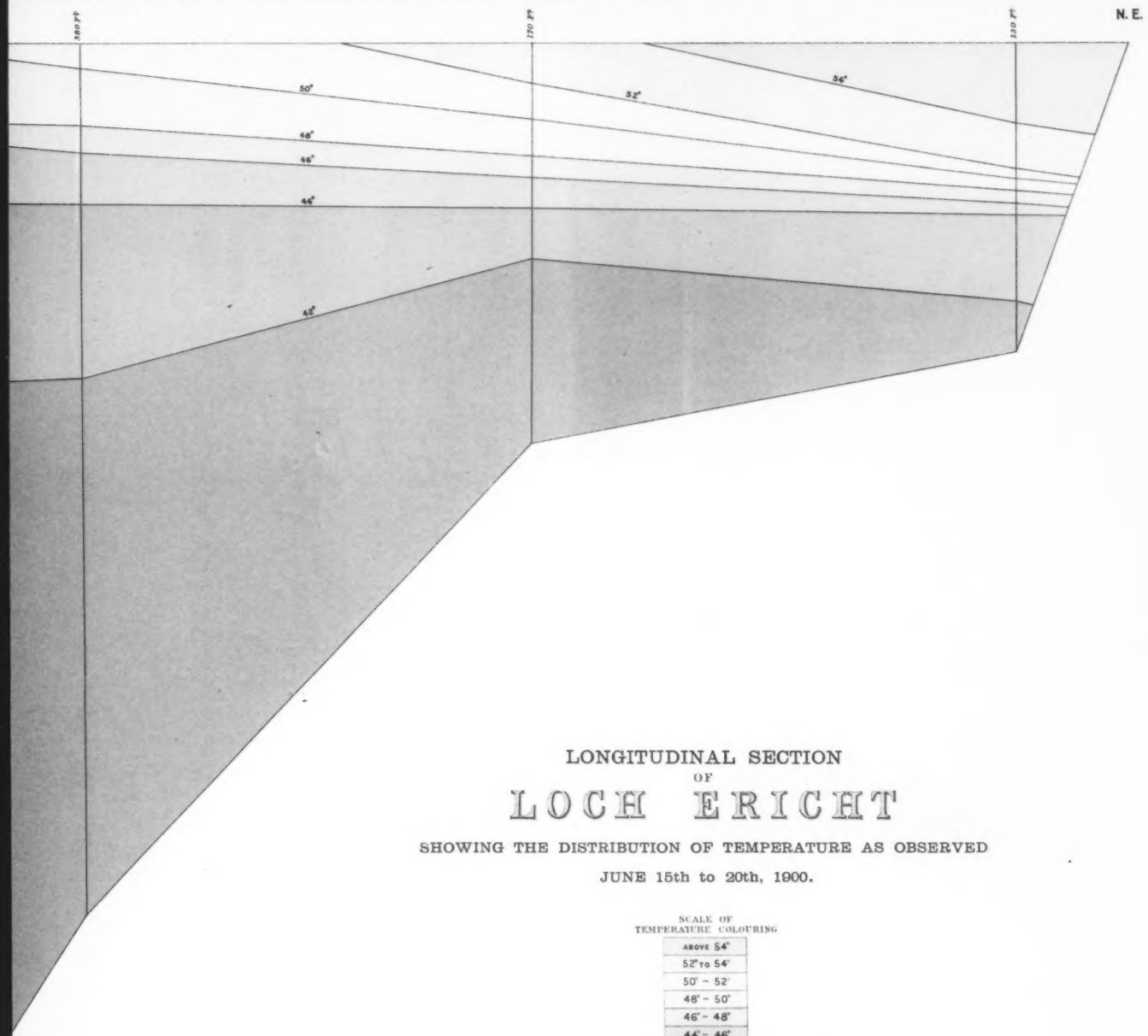
BY SIR JOHN M



ETRICAL SURVEY OF THE SCOTTISH LOCHS.

JOHN MURRAY, K.C.B., LL.D., F.R.S. AND FRED. P. PULLAR, F.R.G.S.

THE GEOGRAPHICAL JOURNAL 1901



LONGITUDINAL SECTION
OF
LOCH ERICHT

SHOWING THE DISTRIBUTION OF TEMPERATURE AS OBSERVED

JUNE 15th to 20th, 1900.

SCALE OF TEMPERATURE COLOURING

ABOVE 54°
52° TO 54°
50° – 52°
48° – 50°
46° – 48°
44° – 46°
42° – 44°
BELOW 42°

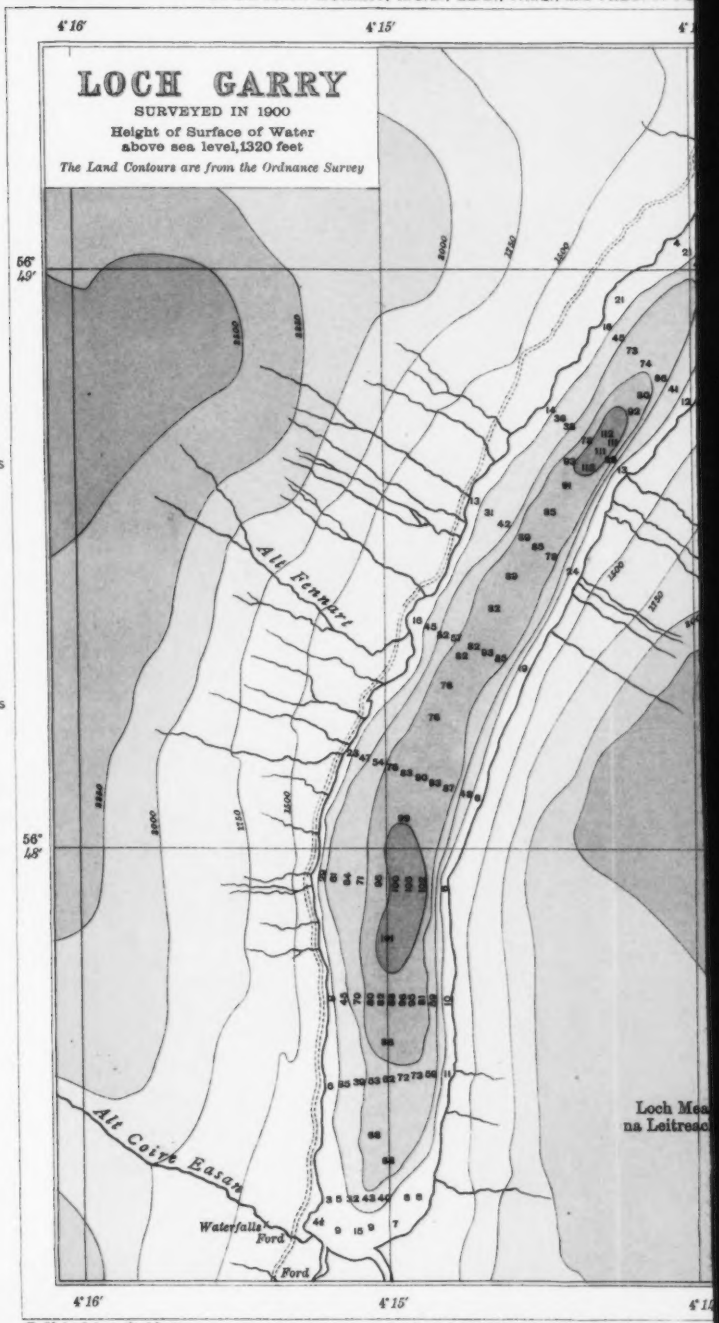
Published by the Royal Geographical Society.

The Edinburgh Geographical Institute. – J. G. Bartholomew.

PLATE IV

BATHYMETRICAL SURVEY OF THE SCOTT

BY SIR JOHN MURRAY, K.C.B., LL.D., F.R.S., AND FRED. P. PU



HEIGHTS IN FEET

FEET	METRES
2500	762
2250	685·8
2000	609·6
1750	533·4
1500	457·2

DEPTHS IN FEET

FEET	METRES
25	7·6
50	15·2
75	22·9
100	30·5

The Edinburgh Geographical Institute

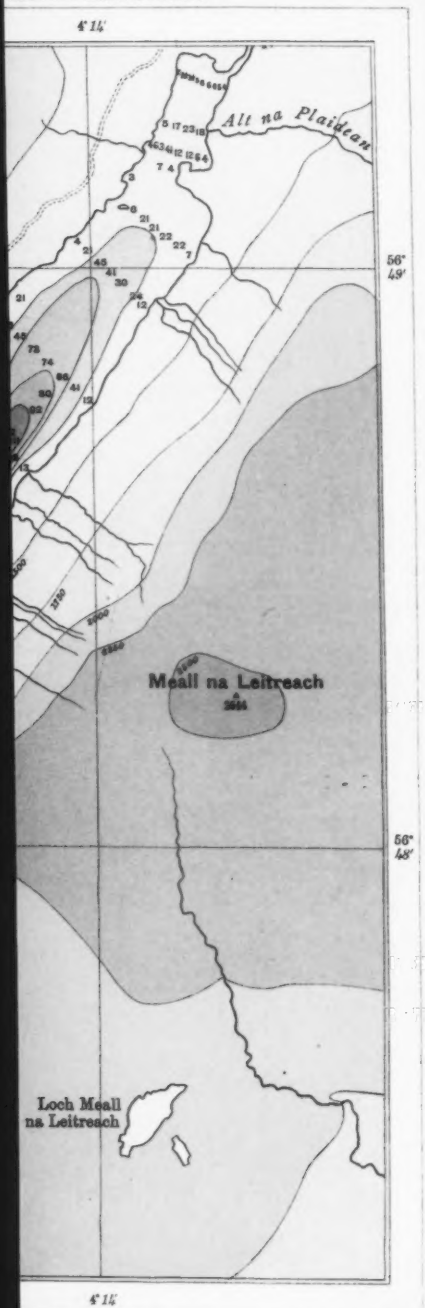
Scale 1 : 21120 3 INCHES TO 1 MILE

0·21 KILOMETRE — 1 CENTIMETRE

Published by the Royal Geographical Society

SCOTTISH LOCHS.

FRED. P. PULLAR, F.R.G.S.

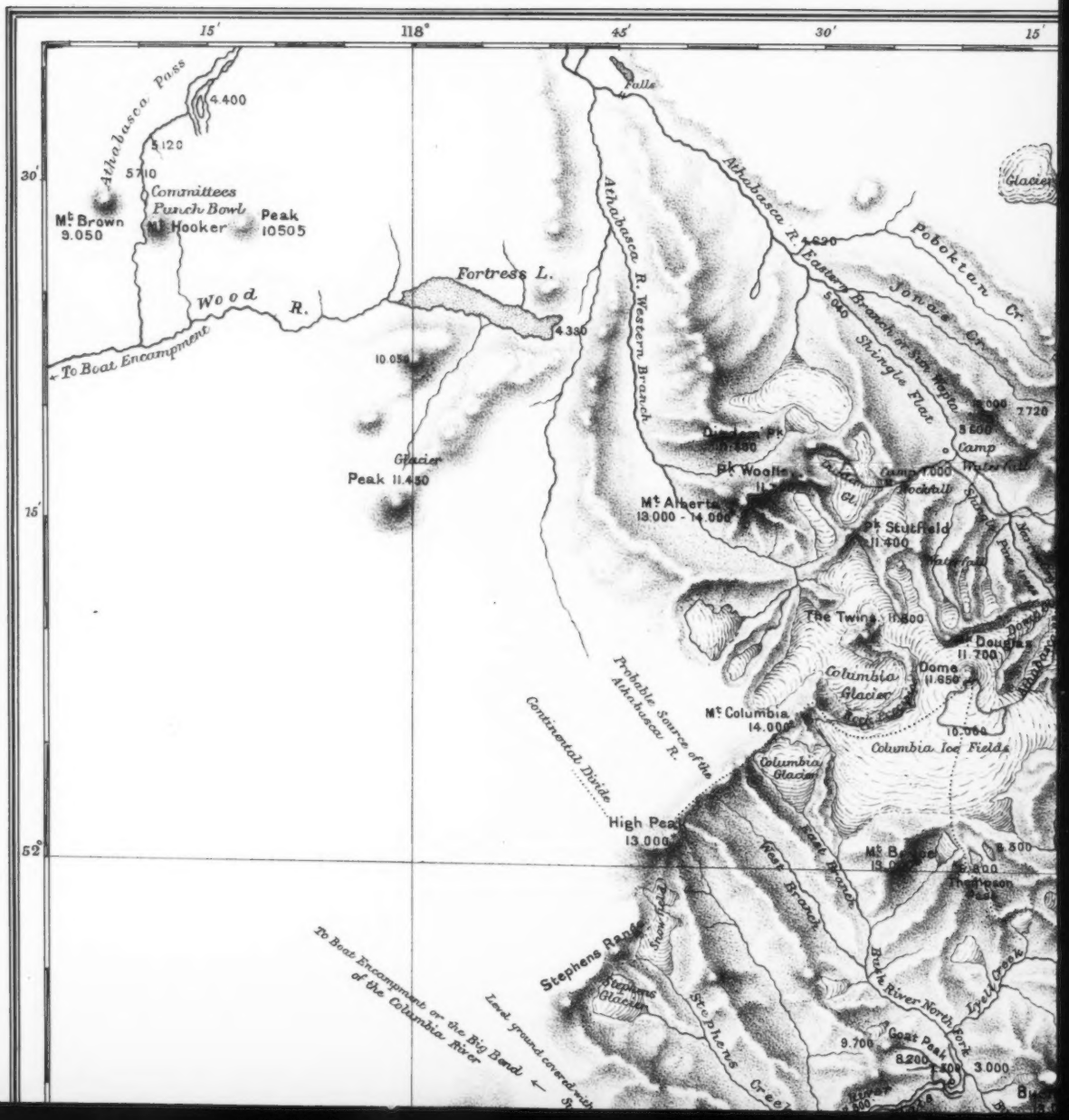


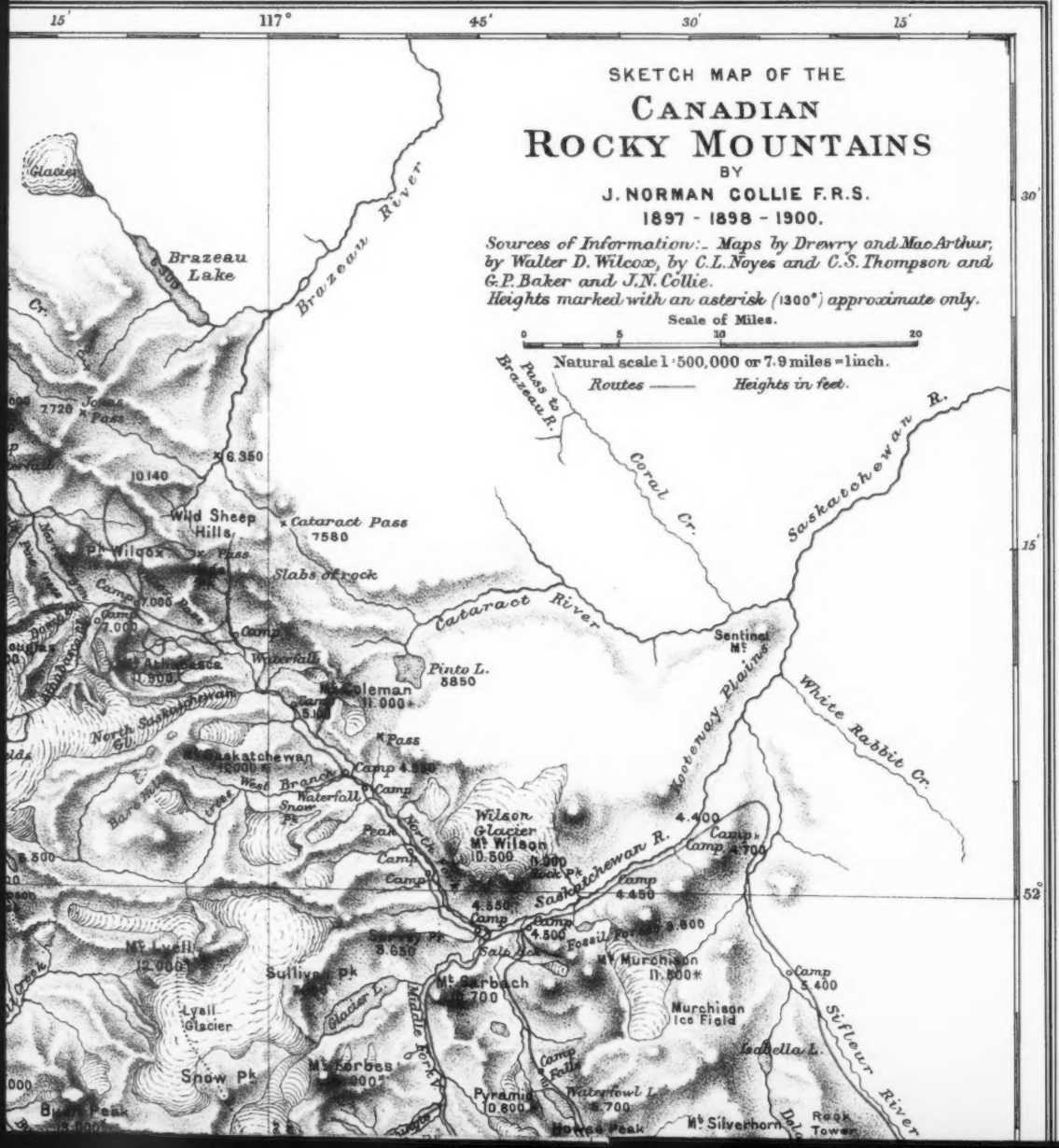
MILE Mile 1. J. G. Bartholomew

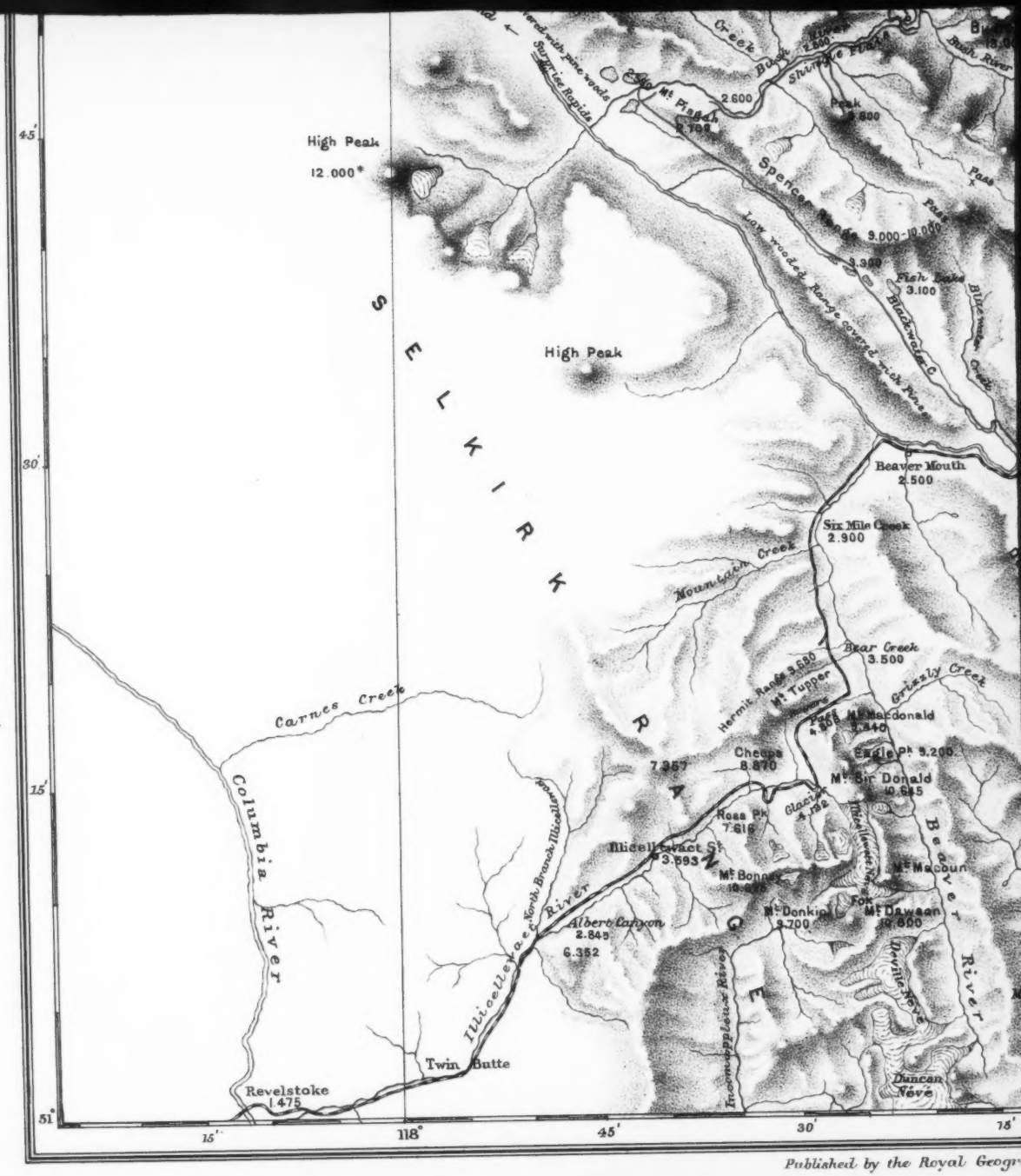
Kilometres 1·61

RE

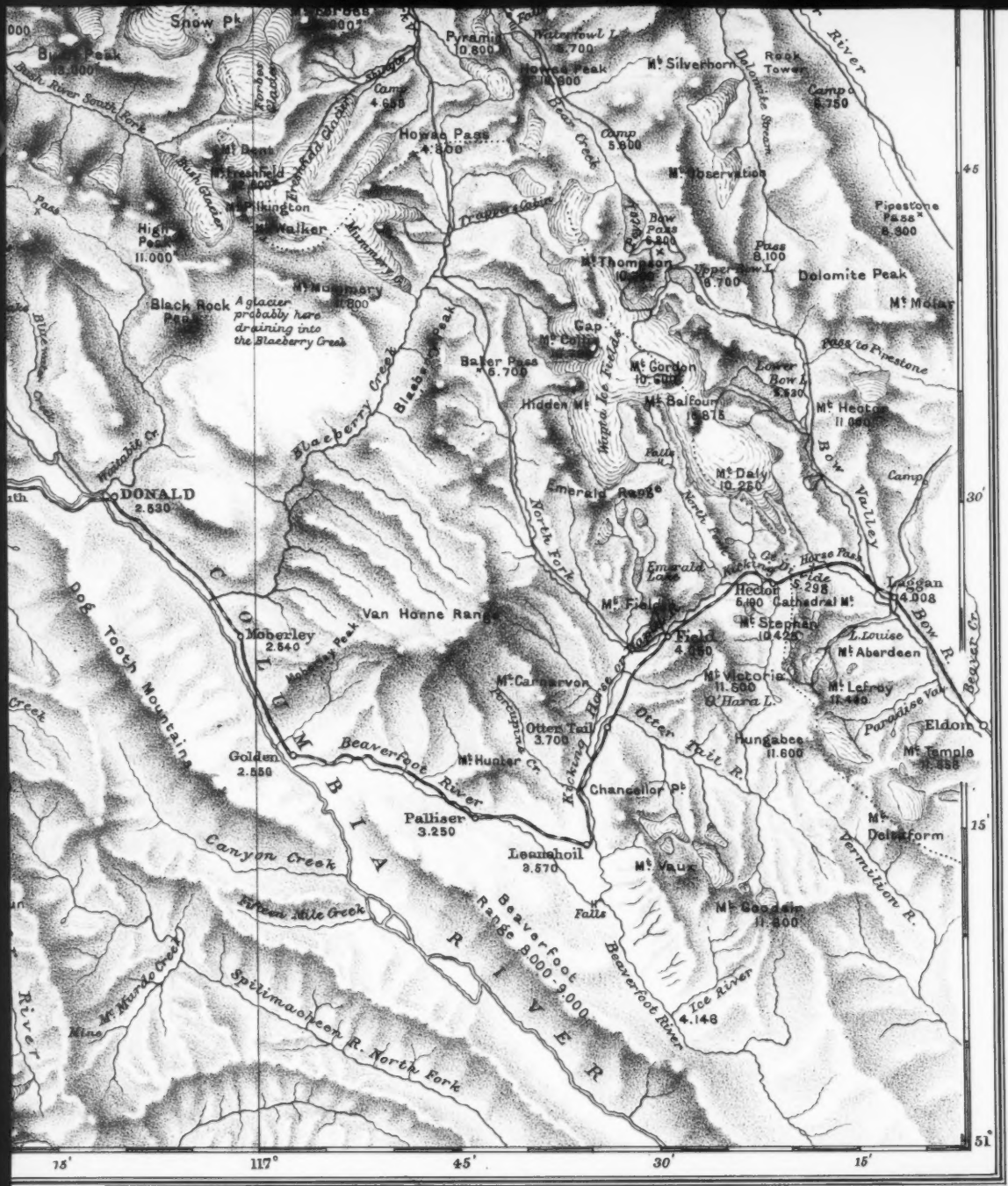
cal Society.


15'
118°
45'
30'
15'
30'
52°
Athabasca Pass
4.400
5.120
5.710
Committees
Punch Bowl
Peak
Mt. Brown
9.050
Mt. Hooker
10505
Wood R.
To Boat Encampment
Fortress L.
4.380
10.054
Glacier
Peak 11.450
Athabasca R. Western Branch
Falls
Athabasca R. Eastern Branch
Pobokton Cr.
Jones Cr.
Shingle Flat
Glacier
Pk. Woolley
Mt. Alberta
13.000 - 14.000
Mt. Stutfield
11.400
Camp
Waterfall
The Twins 11.500
Douglas
11.700
Dome
11.650
Columbia
Glacier
Mt. Columbia
14.000
10.000
Columbia Ice Fields
Probable Source of the Athabasca R.
Continental Divide
High Peak
13.000
Columbia Glacier
West Branch
East Branch
Stephens Range
Stephens Glacier
Stephens Creek
Brazeau River North Fork
Coat Peak
9.700
8.200
3.000
To Boat Encampment on the Big Bend of the Columbia River


15'
117°
45'
30'
15'
30'
15'
52°
SKETCH MAP OF THE
CANADIAN
ROCKY MOUNTAINS
BY
J. NORMAN COLLIE F.R.S.
1897 - 1898 - 1900.
Sources of Information:- Maps by Drewry and MacArthur, by Walter D. Wilcox, by C.L. Noyes and C.S. Thompson and G.P. Baker and J.N. Collie.
Heights marked with an asterisk (1300*) approximate only.
Scale of Miles.
0 5 10 20
Natural scale 1·500,000 or 7·9 miles = 1 inch.
Routes —— Heights in feet.
Brazeau River
Brazeau Lake
Glacier
Pass to Brazeau R.
Coral Cr.
Saskatchewan R.
Cataract River
Cataract Pass 7580
Slabs of Rock
Wild Sheep Hills
Pk Wilcox
Pinto L. 5850
Sentinel Mt
Kootenay Plains
White Rabbit Cr.
Mt Coleman 11.000*
Mt Athabasca 11.000
North Saskatchewan
Mt Saskatchewan 12.000*
Camp 4.850
Waterfall
Wilson Glacier
Mt Wilson 10.500
Camp 4.700
Camp 4.450
Camp 4.500
Fossil Pk 3.800
Mt Murchison 11.800*
Camp 5.400
Sulliva Pk
Mt Lyell 12.000*
Lyall Glacier
Mt Forbes
Snow Pk
Murchison Ice Field
Isabella L.
St Fleur River
Pyramid 10.600
Waterfowl L. 4.700
Howse Peak
Mt Silverborn
Rock Tower
Middle Fork



Published by the Royal Geogra



l Geographical Society.

F S Weller, F.R.G.S. lith.